

*Society of Automotive Engineers.  
Journal*

# S. A. E. Journal

JANUARY, 1928

## INDEX TO VOLUME XXI

*July-December, 1927*



THE SOCIETY OF AUTOMOTIVE ENGINEERS, INC.  
29 WEST THIRTY-NINTH STREET  
NEW YORK CITY

# THE JOURNAL OF THE SOCIETY OF AUTOMOTIVE ENGINEERS

INDEX TO VOLUME XXI, JULY-DECEMBER, 1927

	PAGES		PAGES		PAGES
<b>July</b>	1-108	<b>Agg, Thomas R, on Design and Construction of Highway Systems</b>	200	<b>Cowling for weather extremes a problem</b>	686
<b>August</b>	109-212	<b>Aging tests determine ultimate value of rubber-coated fabrics</b>	398	<b>Difficulties presented by exhaust manifold</b>	687
<b>September</b>	213-328	<b>Agricultural outlook encouraging Ahlm, C E F (discusser)</b>	177	<b>Direct-drive speed of 1400 r.p.m. the limit</b>	685
<b>October</b>	329-450			<b>Divided regulatory authority unsatisfactory</b>	522
<b>November</b>	451-620	<b>Air-Cleaners</b>		<b>Drop demolition and smoke bombs</b>	595
<b>December</b>	621-720	<b>Description of test apparatus</b>	83	<b>Engine and propeller speed too great</b>	685
		<b>Description of, tested</b>	86	<b>Engines</b>	
		<b>Efficiency test for radiator-fan-type</b>	82	<b>Inside fuselage</b>	462
<b>Abell, H C (discusser)</b>	677	<b>Factors that affect amount of dust reaching</b>	84	<b>Accessories pictured</b>	586
<b>Aberdeen Proving Ground</b>		<b>Kind of dust used for tests</b>	83	<b>Excess weight penalizes lower standard</b>	154
<b>Demonstrations</b>	594	<b>Method of determining efficiency</b>	82	<b>Experimental progress outlined</b>	248
<b>Visit</b>	219	<b>Method of dust-feeding</b>	83	<b>Five classes required</b>	247
<b>Abrasive, application of bonded, to cylinders</b>	672	<b>Wind-speed effect</b>	85	<b>Folding steps to aid mail handling</b>	688
<b>Accelerating charge, injection of</b>	188	<b>Air-cooled and water-cooled engines compared</b>	486	<b>Future developments</b>	249
<b>Acceleration</b>		<b>Air-cooled engine, operating temperatures</b>	628	<b>Future of aviation depends on engine</b>	252
<b>Calculation of theoretical</b>	186			<b>Governmental control to continue indefinitely</b>	460
<b>Engine tests</b>	184	<b>Aircraft</b>		<b>Heaviest loads carried at greatest altitude</b>	684
<b>Accelerometer testing apparatus (C M Manly and B Liebowitz)</b>	121	<b>All types have their place</b>	462	<b>High versus low-wing monoplane</b>	462
<b>Accelerometer testing apparatus, description of</b>	124	<b>Application of non-military to Naval purposes</b>	465, 474	<b>Inspection and regulation discussed</b>	461
<b>Accelerometers</b>		<b>Assembled quickly from standardized parts</b>	457	<b>Instrument mountings</b>	581
<b>Experimental runs</b>	126	<b>Astronomical methods of navigation</b>	530	<b>Interior arrangement of the mail</b>	687
<b>Practical road-testing trial</b>	126	<b>Complexity of position-finding</b>	528	<b>Landing gear requires special attention</b>	688
<b>Accidents</b>		<b>Control of design</b>	460, 516	<b>Many, will be needed for training</b>	476
<b>Highway, prevention</b>	423	<b>Determination of drift</b>	529	<b>Monoplane and biplane each holds performance records</b>	460
<b>Prizes for safety suggestions</b>	359	<b>Determination of horizon</b>	530	<b>Monoplane and biplane, relative advantages of</b>	689
<b>Reports of motor-vehicle, in Connecticut</b>	374	<b>Grading of load-factors</b>	518	<b>Monoplane or biplane types compared</b>	460
<b>Scientific-study basis</b>	423	<b>Industry is in close touch with military developments</b>	474	<b>Multi-engine-drive units available</b>	463
<b>Accounting</b>		<b>Inspection of</b>	516	<b>Multi-engined, a vehicle for the future</b>	488
<b>Breaking down expense</b>	114	<b>Instruments for oversea navigation</b>	528	<b>Multiple and single-engined operating costs compared</b>	487
<b>Broad cooperation and elaborate basis needed</b>	114	<b>Load-factors, effect of increasing</b>	517	<b>Must evolve procedure for new instruments</b>	520
<b>Definitions and measurement units important</b>	114	<b>Metal construction</b>	457, 489	<b>Must not be overloaded</b>	521
<b>Ideal classification</b>	114	<b>Minimum strength of</b>	516	<b>New classification by load factor</b>	520
<b>Present vagueness of fundamental terms of motor-vehicle</b>	113	<b>Modern Naval</b>	245	<b>Non-military production growing fast</b>	475
<b>S A E study</b>	113	<b>Naval and commercial flying boats alike</b>	476	<b>Overcoming plumbing troubles</b>	253
<b>To develop standard nomenclature</b>	601	<b>Operation with three-engined</b>	486	<b>Plans for maintenance inspections</b>	521
<b>Accounting and parts replacement</b>	590	<b>Position-finding by radio signals</b>	529	<b>Power control will be needed</b>	248
<b>Accounting subcommittee report at transportation meeting</b>	601	<b>Recent developments in ignition systems</b>	28	<b>Powerplant accessories</b>	248
<b>Accounting Systems</b>		<b>Requirements of various types</b>	245	<b>Problem of transition to war production</b>	475
<b>Operation of motor-vehicles</b>	70	<b>Selection of materials for</b>	456, 494	<b>Problems in transport design</b>	348, 682
<b>Usefulness of forms</b>	70	<b>Should design for easy dismantling</b>	458	<b>Propeller with rotatable blades described</b>	349
<b>Accounting systems for operation of motor-vehicles</b>	70	<b>Single design unsuited for double purpose</b>	151	<b>Purchase of 350 per year planned</b>	310
<b>Accuracy of tire manufacture</b>	139	<b>Three types fitted with Wright Whirlwind engine</b>	478	<b>Put to work</b>	348
<b>Acme Threads</b>		<b>Unadaptability of commercial</b>	476	<b>Questions of inspecting materials</b>	521
<b>Chasing</b>	7	<b>Use of radio goniometric signals</b>	530	<b>Rapid production of training, possible</b>	477
<b>Milling</b>	8	<b>Various methods of preventing corrosion of metal</b>	458	<b>Reducing resistance</b>	248
<b>Profile of</b>	7	<b>Weight can be saved with metal</b>	489	<b>Safety of operation</b>	250, 593
<b>Action and word</b>	477	<b>Why insurance companies make inspections</b>	462	<b>Selection of materials for aircraft structures</b>	456
<b>Adapter ring proposed for fixed focus head-lamp</b>	302	<b>Aircraft carbureters (L S Hobbs)</b>	409	<b>Single versus multi-engine</b>	252, 461, 716
<b>Addresses</b>		<b>Aircraft instruments for overseas navigation (Victor E Carbonara)</b>	528	<b>Speed range an unsatisfactory basis of classification</b>	521
<b>Clarkson, Coker F</b>	582	<b>Airfoils</b>		<b>Stress analysis on structure required</b>	520
<b>Davison, F Trubee</b>	588	<b>Interpretation of results of tests</b>	506	<b>Structural elements</b>	246
<b>Eade, Walter F</b>	585	<b>Recommendations on tests</b>	506	<b>Studies in metal construction</b>	456
<b>Gaunt, W H</b>	606	<b>Size and Reynolds number, effect of</b>	502	<b>Technical problems of the control of airworthiness</b>	460, 519
<b>Glancy, A R</b>	345	<b>Speed, effect of, on lift</b>	500	<b>Three categories of airworthiness</b>	519
<b>Powell, T C</b>	606	<b>Turbulence, effect of</b>	504	<b>Trends in military</b>	452
<b>Seymour, L D</b>	606	<b>Air injection, large Diesel engines use</b>	388	<b>Two engines safer than one</b>	463
<b>Tierney, J W</b>	605	<b>Air-mail evidence introduced in aviation</b>	464	<b>Unadaptability of commercial</b>	476
<b>Adjustable and reversible propellers needed in airplanes</b>	249	<b>Air-Meter</b>		<b>Use of brakes on wheels</b>	252
<b>Advertising fortifies prosperity</b>	382	<b>Elimination of slippage error</b>	224	<b>War, research has broad application</b>	152
<b>Aerial defense, expansion of</b>	220	<b>Engine research</b>	224	<b>Wings seem best place for fuel tanks</b>	688
<b>Aeronautic Division, S A E, activities</b>	581	<b>Method of operation</b>	326	<b>Airplanes for commercial aviation (A H G Fokker)</b>	250
<b>Aeronautic Meeting, S A E</b>		<b>Airplanes</b>		<b>Airport lighting (H E Mahan)</b>	466
<b>Announced, New York City</b>	350	<b>Adjustable and reversible propellers needed</b>	249	<b>Airport planning (John E Nolen)</b>	584
<b>Committee personnel</b>	351	<b>Advantages of duralumin forms</b>	456	<b>Airports</b>	
<b>Inspection trip to Hadley Airport</b>	466	<b>Airline, would not be drafted into military service</b>	475	<b>Berlin's, wins public support</b>	584
<b>Luncheon, pre-meeting</b>	455	<b>All-metal, yet to come</b>	246	<b>Commercial, for New York City</b>	583
<b>New York City, reviewed</b>	455	<b>Alternative changes for altitude work</b>	684	<b>Design and construction of</b>	584
<b>Program</b>	350	<b>Amphibian and convertible</b>	247	<b>Design and cost</b>	584
<b>Registration</b>	468	<b>Balancing and unloading present difficulties</b>	349	<b>New municipal</b>	590
<b>Spokane, reviewed</b>	348	<b>Builders should plan for conversion</b>	477	<b>Place of, in city plan</b>	468
<b>Aeronautical engineering, service aviation and commercial aviation</b>	151	<b>Butt welds in tension not allowed</b>	521	<b>Planning</b>	584
<b>Age of speed, film of Norton Co</b>	345	<b>Cantilever wings of wood</b>	251	<b>Relation to commercial aviation</b>	584
		<b>Carburetor stove for zero temperature</b>	686	<b>Seventy possible metropolitan sites</b>	583
		<b>Commercial engines will need testing</b>	519	<b>Airports and their relation to commercial aviation (Gen J F O'Ryan)</b>	584
		<b>Commercial operators use military-type engines</b>	152	<b>Air-resistance in airplanes, reducing</b>	248
		<b>Conditions adverse to large</b>	486	<b>Air Service</b>	
		<b>Controllable and retractable landing lights</b>	688	<b>Commercial operation of</b>	348
		<b>Corrosion a great problem</b>	246	<b>Developed instruments and methods</b>	152
		<b>Cowl with louvers gives promise</b>	686	<b>Airway lighting (P R Bassett)</b>	466
				<b>Airways</b>	
				<b>Airport lighting and</b>	466



## INDEX TO VOLUME XXI

3

- Boundary lighting of intermediate fields 525  
 Department of Commerce National, engineering 465  
 Engineering, Department of Commerce National 523  
 Failure of current guarded against in lighting 525  
 Ground markers for day flying 524  
 Lighting 524  
 Lighting for night flying 524  
 Organization and administration 527  
 Survey of National 523
- Airworthiness**  
 Technical problems of the control of airplane 519  
 Three categories of 519  
 Albion, F G (discusser) 171  
 Alignment of head-lamp fronts 298  
 All-metal airplanes yet to come 246  
 ALLEN, BERNARD, ON GENERAL THEORY OF CONTAINER USE 602  
 Alloy wire heat-treated after coiling 592  
 Aluminum-alloys, light weight and high conductivity 146
- Aluminum Pistons**  
 Design 147  
 Diesel engines 149  
 Installation of 147
- American Engineering Standards Committee**  
 Bolt, Nut and Rivet Proportions Sectional Committee, activities 321  
 Executive Committee, representative 578  
 Main Committee, representative 578, 717  
 Safety-Code for Brakes and Brake Testing Sectional Committee, activities 322  
 Scientific and Engineering Symbols and Abbreviations Sectional Committee 322  
 Activities 118  
 Report on mathematical symbols 4  
 Small Tools and Machine-Tool Elements Sectional Committee 12  
 Activities 717  
 Representatives 717  
 Standardization of Pipe Threads Sectional Committee, representative 717  
 Americans shift gears, will 176
- American Society for Testing Materials**  
 A-1 on Steels Committee, representative 717  
 Rubber Products Committee D-11, activities 118  
 AMES, WARREN, ON USES OF MICROMETER DIAL-GAGES 715  
 AMMERMAN, K J, ON MOTORCOACH DESIGN 612, 653  
 Amounts of awards for electric arc-welding papers 119  
 Amphibian and convertible airplanes 247  
 Anchorage test of coated fabric shows adhesion of coating 398  
 Angular acceleration of the connecting-rod 319  
 Annual dinner, S A E, announced 621  
 Annual meeting, S A E, announced 621  
 Anomalies, industrial 493  
 Anti-aircraft batteries now formidable 594  
 Anti-aircraft guns effective now 436  
 Antifriction bearings reduce power needs 429
- Antiknock**  
 Cracking-control increases, of gasoline 279  
 Economical operation of engine requires, fuel 278  
 Volatility preferable to 282  
 Application of electric motors to machine-tools (R C Deale) 334, 383  
 Application of non-military aircraft to naval purposes (Edward P Warner) 465, 474
- Arc-Welding**  
 Bibliography 119  
 Electric, papers 119
- Army**  
 Commercial transportation, relation to 608  
 Discussion of maintenance system 599  
 Divisions or departments 542  
 Motor-vehicle depots retained 210  
 Organization for maintenance work 540  
 Production department, functional organization of 541  
 Refinement of details in transport 661  
 Transport types adopted by the 608  
 Transportation, relation to commercial 660  
 Army ordnance developments (W G Wall) 436
- Army system of maintenance of motor transportation (First-Lieut Walter C Thee, U S A) 539, 597  
 Army transport system and requirements 608  
 Army vehicles require great power 588  
 ARTHUR, WILLIAM E, ON DESIGN AND CONSTRUCTION OF AIRPORTS 584  
 Artistry needed in all outside design of bodies 258  
 Asbury, F H (discusser) 434  
 Assembling and testing the Wright Whirlwind engine 368  
 Assignment of tasks and recognition of work 543  
 Astronomical methods of navigation 530  
 Atomic structure of crystalline elements, compact 404
- Atoms**  
 Electrons easy to remove from 406  
 Infinitesimal size of 402  
 Periodic change in volume of 406  
 Practical applications of ionization principles 406  
 Queer metal and rare-earth groups 407  
 Structure of 402  
 Automobile replacement demand 531
- Automobiles**  
 Advantages of electric transmission 182  
 Ample passenger-space required 181  
 Application of torque converter to change in machine-shop methods 419  
 Contrast of old with new production methods 287  
 Conveyor systems aid line-assembly 288  
 Design engineer cooperates with production man in building 288  
 Details of European 180  
 Effect of wet roads on headlighting 21  
 Examples illustrate method of computation of grades 326  
 Exorcising vibration 182  
 External grinding in production 708  
 Farmers buying more 518  
 French, on an American hill 180  
 Good roads should precede 207  
 Great progress made in inspection methods at plants 288  
 High-performance small, here and abroad 180  
 Human element in inspection 120  
 Increased sales possibilities 267  
 International markets 65  
 Lighting 438  
 Manufacturing and testing rubber-coated fabrics 396  
 Measuring grades, can climb 326  
 Modern practices in body designing 257  
 Modern production methods 286  
 Multi-purpose machine is a boon in production 283  
 Must revise conceptions of design when welding parts 440  
 Narrow treads 183  
 Next move in motor fuel up to builders 283  
 Only four cylinders needed 181  
 Overcoming resonance 183  
 Passenger-cars affected as to lighting 50  
 Performance sells cars 182  
 Recent trends in tire construction 586  
 Replacement demand 531  
 Saturation-point 586  
 Small car can be comfortable 182  
 Speed with safety 716  
 Three speeds on large European 176  
 Tires as a cause of shimmy 135  
 Two desirable quiet driving-ranges 99  
 Weight distribution 174  
 What the dealer should do 144  
 Wider roads for more 63  
 World leadership in service facilities 716  
 Automotive engineering schools, should start 626  
 Automotive equipment, influence of large-scale user on design and construction of 589
- Automotive Industry**  
 Cast iron in its relation to the 254  
 Cooperative training in 625  
 Electrical industry compared with 587  
 Improving service and market 387  
 Latest developments in equipment 588  
 1927 grinding practice in 343  
 Today's demand on the engineer 586  
 Automotive possibilities for the oil-burning engine 98  
 Automotive transportation (J F Winchester) 632  
 Auxiliaries are a troublesome problem in electrical systems 428
- Aviation**  
 Airports and their relation to commercial 584  
 Air service developed instruments and methods 152  
 Air travel exemplified 625  
 Altitude helps in locating objective 702
- Available methods for measuring drift 701  
 Business leaders aware of influence 584  
 Commercial 715  
 Commercial, aeronautical engineering and service aviation 151  
 Duties of the aviator are exacting 639  
 Expansion of our aerial defense 220  
 Experiments made in passenger carrying 607  
 Future of, depends on engine 252  
 Ground markers for day flying 524  
 Help to industry pledged by National Safety Council 464  
 Here to stay 607  
 High flying 624  
 Meteorologist's help is important in oversea navigation 700  
 Much preliminary work is possible for oversea navigation 699  
 Must convince public of reliability 154  
 Naval activities 310  
 Observation calculations are pre-computed 702  
 Oversea navigation 463, 699  
 Planning an around-the-world flight 623  
 Possible reason for ocean flight failures 485  
 Prizes still open for competition 586  
 Problem of a cheaper commercial powerplant 153  
 Problems in transport-airplane design 682  
 Progress of civil, in Britain 66  
 Radio for bad-weather flying 526  
 Route presents a laboratory for research 683  
 Service, aeronautical engineering and commercial aviation 151  
 Single design of aircraft not suited for double purpose 151  
 Weather reports and communications for 526
- Aviation**  
 Air-mail evidence introduced 464  
 Drift is hard to measure 463  
 Meteorological cooperation recounted 464  
 Oversea 463  
 Axial and perpendicular components of the force required to accelerate the connecting-rod 316
- Axles**  
 Accurate settings needed to prevent shimmy 141  
 Four-speed-transmission and, combination 102  
 Inspection and maintenance 437  
 Maintaining motor-truck 583
- B**  
 Bachman, B B (discusser) 181  
 BACHMAN, B B, ON CHARACTERISTICS AND FIELD OF USEFULNESS OF THE MOTOR-TRUCK 630  
 Balance, reciprocating, in engines of six and eight cylinders 315, 448
- Balancing**  
 Airplanes present difficulties 349  
 Tires 142
- Balancing Machines**  
 Dynamic 339  
 Static 339
- Ball and Roller Bearings Division, S A E**  
 Activities 5, 441  
 Standards approved by letter-ballot 6  
 Subject assigned 717  
 Ball bearings, fewer sizes 5  
 Ballentine, N D (discusser) 80  
 Balloon tires, large, of six plies 139
- Banking**  
 Curves on hills 209  
 Highways, importance neglected 209  
 Banquet at transportation meeting, S A E 605  
 BARKER, E F, ON STRUCTURE OF ATOM 402  
 Barnard, D P, 4th, (discusser) 132  
 Basing produces filament inaccuracies 302  
 BASSETT, P R, ON AIRWAYS LIGHTING 466  
 Batteries, anti-aircraft, now formidable 594  
 Battery ignition development 37  
 Battery specifications, revised 117  
 Battery-terminals, proposed 320  
 Battery versus magneto ignition 38  
 Baumgartner, W J (discusser) 171  
 Beads unaffected by heat of flexion 168
- Beams**  
 Directed to right increase visibility 26  
 Effects of shifting, to right 23

**Beams (Concluded)**

Results obtained from laboratory work	21
Water on lens diffuses	23
Bearing pressures on wristpin	241

**Bearings**

Advantages of plain	178
Antifriction, reduce power needs	429
Changes in clearance affect oil-flow	128
Oil-flow through crankshaft and connecting-rod	127
Standard motor, proposed	441

BEATTY, LEE M, ON WRIGHT WHIRLWIND ENGINE PRODUCTION METHODS	337, 361
BECKER, L A, ON EXTERNAL CYLINDRICAL HONING	334, 377
Becker, L A (discusser)	677

BEDFORD, C W, ON DYNAMOMETER TEST OF BRAKE-DRUM HEAT IN DUAL WHEELS	160
---------------------------------------------------------------------	-----

Bedford, F J (discusser)	676
Beecroft, David (discusser)	267
Belts, fans and pulleys, standardization	647

BENNETT, JAMES C, ON FUSION-WELDING DEVELOPMENTS	439
Berlin's airport wins public support	584
Bernhard, Edward W (discusser)	549

Best, Percy (discusser)	149
BESWICK, JOHN C, ON TRAINING MEN FOR THE AUTOMOTIVE INDUSTRY	625

Better use of coal	242
--------------------	-----

**Bibliography**

Arc-welding	119
Cooperative-fuel-research work	190
Production papers	639
Rubber	264
Vehicle operators	116

BIDDLECOMBE, C H, ON WRIGHT WHIRLWIND ENGINE IN COMMERCIAL OPERATION	468, 478
----------------------------------------------------------------------	----------

Biplane and monoplane, relative advantages of	689
-----------------------------------------------	-----

Biplane or monoplane	460
----------------------	-----

BLAKER, ERNEST, ON DYNAMOMETER TEST OF BRAKE-DRUM HEAT IN DUAL WHEELS	160
-----------------------------------------------------------------------	-----

BLANCHARD, E P, ON INTEGRATED PRODUCTION	227, 337
------------------------------------------	----------

Board of Award of the Guggenheim Medal, representatives	578
---------------------------------------------------------	-----

**Bodies**

Artistry needed in all outside design	258
Cheat-lines used to accentuate length	258
Cost of increasing width and head-room	658

Custom designer rules his realm	261
Design	629
Design should simplify repairing	629
Designer must be a creator	261
Economy of standard motorcoach	658

Fundamental dimensions that affect comfort	257
--------------------------------------------	-----

Modern practices in designing automobile	257
------------------------------------------	-----

Most troubles due to faulty work	630
Motor transport varieties must be restricted	663

Radical, designed for speed	629
Results of deviation from standard design of motorcoach	658
States most active regulatory	50
Treatment that enhances comfort	261

Body design (Alben F Carlson)	629
Bohner, C C (discusser)	302

Boller, successful, is awaited for steam rail-cars	610
----------------------------------------------------	-----

Bolsheviks and science	242
------------------------	-----

Bolt, Nut and Rivet Proportions Sectional Committee, activities	321
-----------------------------------------------------------------	-----

Bolts, round unslotted-head	6
-----------------------------	---

Bombs, airplanes drop demolition and smoke	595
--------------------------------------------	-----

Boston & Maine begins motor-truck operation	44
---------------------------------------------	----

Bouton, Eugene (discusser)	549
----------------------------	-----

**Brake Drums**

Effect of wheel-speed very important on temperature	165
Factors included in charts of results	163
Fitting shoes in worn	173
Heat in dual wheels, dynamometer test of	160
Temperature measurements and method of testing	162
Wheels, fans and, used in test	162

**Brake-Linings**

Bureau of Standards	553
Testing-equipment	554
Tests	553
Carson type of testing-machine	551
Continuation of 1922 report on tests	552
Difficulty with	172
Equipment and methods in tests	552
Equipment simulating service conditions	560

Foreign testing-equipment	562
Lockheed type of testing equipment	564
Studebaker type of testing-machine	560
Testing-machines	558
In some other laboratories	564
Used by a truck builder	173
Brakeshoes, fitting in worn drums	173

**Brakes**

Affected by regulations	52
Development relation to state laws	51
Internal wheel, for high-speed heavy vehicles	171
Metal-to-metal, require power application	173
Question of life	172
Safety-code issued	322
Seeking to unify requirements	52
Use of, on airplane wheels	252

Braking, electric, and torque insulator	270
Breaker-mechanism, high-speed, for aircraft ignition	35

BROOKS, D B, ON OIL-FLOW THROUGH CRANKSHAFT AND CONNECTING-ROD BEARINGS	127
-------------------------------------------------------------------------	-----

BROOKS, D B, ON QUANTITATIVE EFFECT OF ENGINE CARBON ON DETONATION	59
--------------------------------------------------------------------	----

Brown, George C (discusser)	280
BROWN, R W, ON RIDING-QUALITIES INSTRUMENTATION	126

Brown, W C (discusser)	434
Brownback, H L (discusser)	180
Brunner, H E (discusser)	429

BRYANT, GEORGE T, ON COMMERCIAL AVIATION	589
------------------------------------------	-----

BUCKINGHAM, EARLE, ON PROFILE OF ACME THREADS	7
-----------------------------------------------	---

Budget, time-study in its relation to labor	386, 444
---------------------------------------------	----------

Budgeting is not rate guessing	549
--------------------------------	-----

Bureau of Standards	554
Brake-lining tests	553
Testing-equipment for brake-linings	144

Bushey, J S (discusser)	586
Business conditions in China (Esson M. Gale)	430

BUSSEY, C G, ON MAINTENANCE OF WIDELY DISTRIBUTED OIL-TRUCKS	521
--------------------------------------------------------------	-----

Butt welds in tension not allowed in airplanes	521
------------------------------------------------	-----

Calculation of centrifugal pressure on oil in the crank-cheek	131
---------------------------------------------------------------	-----

Cam ring, production of, for Wright Whirlwind engine	368
------------------------------------------------------	-----

Camber	42
Effect of too much, on tire wear	136
Toe-in and, affect tire wear	150

Camp, A D (discusser)	588
CAMPBELL, MAJOR L H, U S A, ON LATEST DEVELOPMENTS IN AUTOMOTIVE EQUIPMENT	625

CAMPION, H A, ON TRAINING MEN FOR THE AUTOMOTIVE INDUSTRY	709
-----------------------------------------------------------	-----

Camshaft, aid to grinding	434
Canavan, J J (discusser)	424
CANDEE, A H, ON INTERNAL-COMBUSTION ENGINES IN RAIL TRANSPORTATION	676
Cannon, R H (discusser)	717

Capital, competition of	717
-------------------------	-----

Carbon	60
Apparatus and test methods used with engines for	62
Conclusions deduced from tests for	60
Increase of detonation with	62
Influence of "carbon remover" on deposit	59
Quantitative effect of engine, on detonation	61
Relative effect of deposit on various parts	20
Carbon-depositing tendency of heavier motor-oils (C J Livingstone, Samuel P Marley and W A Gruse)	528
CARBONARA, VICTOR E, ON AIRCRAFT INSTRUMENTS FOR OVERSEA NAVIGATION	528

Carbureters	409
Aircraft	652
Duplex flanges	411
Exhaust gas for heating intake	410
Fuel-feed control	410
Greater engine flexibility affects	411
Hot-spot above the	410
Ice formation	412
More heat at part throttle	410
Problems with superchargers	412
Quantity will permit needed differentiation	409
Reduction in size	686
Stove for zero temperature	85
Variations in air-requirement	629

CARLSON, ALBEN F, ON BODY DESIGN	629
----------------------------------	-----

CARLSON, R E, ON EFFECT OF WET ROADS ON AUTOMOTIVE HEADLIGHTING	21
Carson type of testing-machine	558

**Cast Iron**

Control of "growth"	255
Degrees of hardness	255
Metallurgical considerations	255
Proper use of raw materials	255
Relation to the automotive industry	255

Cast iron in its relation to the automotive industry (E J Lowry)	254
------------------------------------------------------------------	-----

Cast steel, higher standard resulting from X-ray testing	159
----------------------------------------------------------	-----

Caster angle is the key to shimmy	140
-----------------------------------	-----

**Castings**

Defect-free, have full metal-strength	158
Testing and machining crankcase for Wright Whirlwind engine	362
X-ray testing valuable for developing better designs	158

Catalytic action is confirmed in spraying finishes	698
----------------------------------------------------	-----

Cellulose-nitrate coated fabrics (E H Nollau)	393
-----------------------------------------------	-----

Cement securing base to bulb withstands 80-lb pull	302
----------------------------------------------------	-----

Centrifugal pressure on oil in the crank-cheek, calculation of	131
----------------------------------------------------------------	-----

Chandler, F F (discusser)	144
Chandler, M C (discusser)	422

Characteristics and field of usefulness of the motor-truck (B B Bachman)	630
--------------------------------------------------------------------------	-----

Charts, organization and production-control forms	194
---------------------------------------------------	-----

Chasing Acme threads	7
Chassis, suggests eliminating frame	630

CHATFIELD, C H, ON MONOPLANE OR BIPLANE	460
-----------------------------------------	-----

Cheat-lines used to accentuate length of bodies	258
-------------------------------------------------	-----

CHENOWETH, OPIE, ON SUPERCHARGED ENGINE PERFORMANCE, CALCULATED AND ACTUAL	466, 508
----------------------------------------------------------------------------	----------

China	106
China, business conditions in	586
Chromium-vanadium steels, correlating test-data on heat-treated	344

CHURCH, H D, ON INTERNAL WHEEL-BRAKES FOR HIGH-SPEED HEAVY VEHICLES	171
---------------------------------------------------------------------	-----

Circulatory and oscillatory methods differ	416
--------------------------------------------	-----

Citizenry capable of exercising war power	374
-------------------------------------------	-----

Clark, E A (discusser)	626
CLARK, ELIZABETH, ON TRAINING MEN FOR THE AUTOMOTIVE INDUSTRY	242
CLARK, H H, ON NOTES ON VALVE-SPRING SURGE	190
Clarkson, Coker F, address	582
CLAYDEN, A LUDLOW, ON GASOLINE—PAST, PRESENT AND FUTURE	277
Cleveland machine-tool session at production meeting, S A E	333

Clutch-Housing	648
Holes changed	118

Coal	150
A raw material, not a fuel	242
Better use of	677
Coarse stones and kerosene prevent overheating in cylinder grinding	598
Coast repair-shop practices summarized	598

Coated Fabrics	398
Aging tests determine ultimate value	400
Analysis of coating and fabric	398
Anchor test shows adhesion of coating	398
Cellulose nitrate	393
Embossing and two-tone finishing	394
Fold test shows resistance to breaking	398
How coating is applied	396
Importance of tensile-strength test	400
Materials and finished product tested rigidly	394
Materials used in manufacture	393
Permeability by water, test for	398
Preparation of coating composition	394
Resistance to edge-cracking of, test for	400
Scrub test usable by the consumer	397
Strength of combining, test for	399
Test by ultra-violet light insufficient	401
Tests applied to	397
Two ways of using tests	400
Weather-exposure test extends over 1 year	400
Weaves of base	394

Coating	400
Analysis of fabric and	396
How applied to fabric	396



## INDEX TO VOLUME XXI

5

- Combustion products, relations between volumes and percentages of 574  
Commercial airplane operators use military-type engines 152  
Commercial airport for New York City (William F MacCracken, Jr) 583  
Commercial aviation (George T Bryant, William B Stout, William G Wall, and George M Williams) 589  
Commercial aviation (J P Porter) 715  
Commercial Motor-Transport Exhibition 115  
Commercial operation of Air Service (C C Moseley) 348  
Common-carrier trucking under State regulations (E L Murphy, Jr) 604
- Committees**  
A-1 on Steels of American Society for Testing Materials, representative 717  
Aeronautic meeting, personnel 351  
American Engineering Standards, main, representative 717  
Bolt, Nut and Rivet Proportions Sectional, activities 321  
D-11 for Rubber Products of American Society for Testing Materials, activities 118  
Highway Research, activities 360  
Operation and Maintenance, S A E Activities 113  
Reports at transportation meeting 601  
Pattern Equipment Standardization Joint, activities 11  
Research, S A E, activities 18  
Safety-Code for Brakes and Brake Testing Sectional, activities 322  
Scientific and Engineering Symbols and Abbreviations, Sectional Activities 118  
Report on mathematical symbols 4  
Small Tools and Machine-Tool Elements Sectional Activities 12  
Representatives 717  
Standardization of Pipe Threads, Sectional, representative 717  
Transportation meeting, S A E, personnel 352  
Compact atomic structure of crystalline elements 404  
Competition for the consumer's dollar 387  
Competition of capital 717  
Concrete-slab, reinforced, design of road 204  
Connecticut motor-vehicle law 373  
Connecticut, motor-vehicle speed in 170  
Connecting-rod bearings, oil-grooves in, effects of 133
- Connecting-Rods**  
Aluminum 241  
Angular acceleration of the 319  
Axial and perpendicular components of the force required to accelerate Division of, into reciprocating and rotating elements theoretically correct 317  
Stresses 241  
Tests and operations in Wright Whirlwind engine 368  
Constantinesco torque-converter (R K Jack) 413  
Constitutional amendment adopted 109  
Consumer's dollar, competition for 387  
Contact-accelerometer gap-error (B Liebowitz) 121
- Containers**  
Duralumin bodies found economical 603  
General theory of use 602  
How used in England 602  
Tractor-trailer terminal-handling of freight 602  
Continuation of the 1922 report on brake-lining tests (S von Ammon) 551  
Control of aircraft design (E W Stedman) 460, 516  
Controllable and retractable landing lights 688  
Conveyor systems aid line-assembly 288  
Cooperative fuel research bibliography 190  
Coordinated rail and motor-truck transportation (George W Dixon) 604, 680  
Correlating test-data on heat-treated chromium-vanadium steels (E J Janitzky) 344
- Corrosion**  
Great problem in airplanes 246  
Various methods of preventing, of metal aircraft 458
- Cost Accounting**  
Application of 198  
Activities desirable 342  
Report 645  
Cost problems of motor carriers (Franklin D Howell) 228, 443
- Costs**  
Basis of emphasis on keeping 113  
Charts show big operating, reduction 600  
Design and, of airports 584  
Expedient for saving die 490  
Idle time a big factor in motor-truck 359  
Increasing width and headroom of motorcoach 658  
Maintenance included in road 205  
Many factors affect ton-mile 434  
Mass production required to decrease 543  
Method of predetermining labor 386  
More to distribute than to produce 448  
Motor-vehicles pay \$1,000,000,000 road 58  
Multiple and single-engined airplane operating, compared 487  
Problems of control 119  
Problems of motor carriers 228  
Proper interpretation of data presented on truck operation 538  
Rates changed for increased production 548  
Reducing farming 358  
Road courtesy and 542  
Simplification or specialization reduces Standard unit, and classification needed 229  
for motorcoaches  
Ton-mileage versus hourly basis of fleet operation 435  
Users' highway, hidden 208  
Using truck-operating, to increase delivery efficiency 535, 604  
Weight distribution affects tire 654
- Council Meeting, S A E**  
September 578  
November 717  
Cousins, E A (discusser) 104  
Cowl with louvers gives promise 686  
Cowling for weather extremes a problem 686  
Cox, Donald S (discusser) 284  
Cracking-control increases antiknock property of gasoline 279  
Cracking plants, number of 324  
Cracking processes 369  
Crane, H M (discusser) 73  
Crankcase-oil dilution, relation of end-point of gasoline to 284  
Crankcase oils, numbers for 581  
Crankcase, testing and machining Wright 362  
Whirlwind engine, casting 122  
Crank motions versus rotating weights 127  
Crankshaft and connecting-rod bearings, oil-flow through 127  
Crankshaft, eighty-five operations on, in Wright Whirlwind engine 367  
Crawford, C S (discusser) 174  
CROWELL, BENEDICT, ON MECHANIZED ARMY WILL WIN NEXT WAR 588  
Crystalline elements, compact atomic structure of 404  
CUMMINS, C L, ON DEVELOPMENT OF THE AUTOMOTIVE DIESEL OIL-ENGINE 388  
Cummings method of injection 392  
Cylinder barrels for Wright Whirlwind engine machined from steel forgings 364  
Cylinder-head, machining operations on Wright Whirlwind engine 363
- Cylinders**  
Analysis of conventional method of grinding necessary 670  
Analysis of disadvantages of lapping 672  
Application of bonded abrasive to 672  
Assembled with shrink fits in Wright Whirlwind engine 364  
Coarse stones and kerosene prevent overheating 677  
Construction of efficient 479  
Corrective measures in grinding 673  
Development in grinding 334, 669  
Diameter and thermal efficiency 239  
Errors due to two causes 671  
External honing 377  
Flooding, with oil 132  
Honing 377  
Compared with lapping 378  
Corrects inaccuracies 378  
Factors analyzed 378  
Machine used for polishing 380  
Shows grinding errors 378  
Lapping and honing compared 377  
Lubrication 311  
Only four, needed in automobiles 181  
Problems encountered in production 674  
Ratio of rotation to reciprocation 677  
Recent developments in grinding 675  
Reciprocating balance in engines of six and eight 315, 448  
Run cooler with rich mixture 482  
Summary of causes of imperfections in grinding 672  
Temperature, and volatility of fuel 313  
Cylindrical-honing, external 334
- D**  
Daily cleaning is necessary in spraying finishes 697
- Dammann, H W (discusser) 143  
Damping, relation of number of spring leaves to 237  
Darrow, Burgess (discusser) 138  
DAVIDSON, M W, ON RECIPROCATING BALANCE IN ENGINES OF SIX AND EIGHT CYLINDERS 315, 448  
Davison, F Trubee, address 588  
Day, R B (discusser) 138  
DEALE, R C, ON APPLICATION OF ELECTRIC MOTORS TO MACHINE-TOOLS 334, 383  
Decentralization 712  
Defect-free castings have full metal-strength 158
- Defects**  
Interpretation of, in metals as to causes 157  
Pictures show nature of, in metal 156  
Definitions of terms 693  
Delbridge, T G (discusser) 282  
Department of Commerce National airways engineering (F C Hingsburg) 465, 523
- Depreciation**  
Allowances for machine-tool 533  
Reserve for machine-tools 532  
Unknown quantity in motorcoaches 228  
Design and construction of airports (William E Arthur) 584  
Design and construction of highway systems (Thomas R Agg) 200  
Design and material decide life of valve-spring 592  
Design and operation of self-propelled railroad cars (W C Sanders) 608  
Design requirements for aircraft ignition-systems 29  
Detonation 668
- Detonation**  
Fundamental laws and theory 668  
Increases with carbon 60  
Quantitative effect of engine carbon on 59  
Simple mechanism produces complex results 668  
Detroit Super Charger 589  
Development of the automotive Diesel oil-engine (C L Cummins) 388  
Development of the high-speed Diesel engine (F M Heldt) 87  
Development of Wright Whirlwind engine, its design, construction and production (E T Jones) 627  
Developments in cylinder grinding (M C Hutto) 334, 669  
Devine, A W (discusser) 301  
Dickinson, Dr H C (discusser) 132, 300  
Die-cost, expedient for saving 490  
Die, jig and fixture details 577
- Diesel Engines**  
Advantages 98  
Aluminum pistons for 149  
Development 179  
Development in America 94  
Development of high-speed 87  
Disadvantages 98  
Engineering problems of 95  
High-speed 88  
Large, use air injection 388  
Diesel oil-engine, automotive, development of 388  
Dinners, annual, S A E, announced 621  
Direct-drive speed of 1400 r.p.m. the limit in airplane engine 685  
Distillate, engine, specification 441  
Distribution and production 448  
DIXON, GEORGE W, ON COORDINATED RAIL AND MOTOR-TRUCK TRANSPORTATION 604, 680  
Dodge, A Y (discusser) 171  
DONKIN, W T, ON NOTES ON VALVE-SPRING DESIGN 590  
DONKIN, W T, ON NOTES ON VALVE-SPRING SURGE 243  
Double-adjusting difficulty demonstrated 303  
Double-filament head-lamps a doubtful development 290  
Drift, available methods for measuring airplane 701  
Drift of aircraft is hard to measure 463  
Drills, taps and milling cutters 576  
Driver's and mechanic's work wholly separate 435  
Drivers, value of keeping track of fleet 434  
Driving-ranges for automobiles, two desirable quiet 99  
Duby, John F (discusser) 139  
DUCKER, P H, ON INSPECTION AND MAINTENANCE METHODS 437, 582  
DUFFY, NATHANIEL, ON NEW MUNICIPAL AIRPORT 590  
Duplex-carburetor flanges 652
- Duralumin**  
Container bodies found economical 603  
Forms for airplanes, advantages of 456

**Dust**

Explosions are possible	695
Factors that affect amount reaching air-cleaners	84
Kind used for air-cleaner tests	83
Method of feeding to air-cleaners	83
Dynamic balancing-machine	339
Dynamic tests of leaf springs	235

**Dynamometer**

Measurement of hill-climbing by chassis	326
Test of brake-drum heat in dual wheels	160
Dynamometer test of brake-drum heat in dual wheels (C W Bedford and Ernest Blaker)	160

**E**

Esade, Walter F, address	585
Economic stage of problems of roads	207
Economical-grade determination of highway, factors affecting	203
Economical life of commercial passenger-vehicles	13
Economical operation of engine requires antiknock fuel	278
Economies effected increase prosperity	376
Economy, operating of engine	100
Edge-cracking of coated fabrics, test for resistance to	400
Education and industry, coordination of	266
Effect of wet roads on automotive headlighting (R E Carlson and W S Hadaway)	21
Effect of wheel-setting on wear of pneumatic tires (J E Hale)	41
Effects of legislation on design of automotive vehicles (D C Fenner and M C Horine)	49

**Efficiencies**

Generator and motor, in electric drive	270
Method of determining air-cleaner	82
Motor, in electric drive	270
Thermal, and cylinder diameter	239
Using truck-operating costs to increase delivery	535, 604
Work units combined for greatest efficiency test for radiator-fan-type air-cleaners (A H Hoffman)	82
EISINGER, JOHN O, ON ENGINE-ACCELERATION TESTS	184
Electric arc-welding papers	119

**Electric Arc-Welding Papers**

Amounts of awards	119
Practical uses must be outlined	119
Electric cars, motorcoach influence on	507

**Electric Drive**

Advantages and drawbacks	271
Comparison with standard transmission	270
Engineering factors and design limitations	268
Future developments	276
General features	273
Generator and motor efficiencies	270
Installation and weight considerations	269
Motorcoach transmission	268
Recent developments	273
Electric drive as a motorcoach transmission (Charles Froesch)	268
Electric furnaces, variety of	346

**Electric Motors**

Application to machine-tools	334, 383
Dimensional variations and standardization	384
Gear drives for	383
Electric transmission, advantages of	182
Electrical and automotive industries compared	587
Electrical charges, elements composed of	403

**Electrical Equipment Division, S A E**

Activities	117, 320, 648, 649
Standards approved by letter-ballot	6
Subject assigned	717
Electrical power transmissions, auxiliaries are a problem in	428
Electrical requirements for aircraft ignition-systems	29
Electrification of railroads not universally available	425

**Electrons**

Easy to remove from atoms	406
Groups for inert gases	407
Increased nuclear charge adds	403

**Elements**

Characteristics of the more complicated	406
Compact atomic structure of crystal-line	404
Composed of electrical charges	403
Negative-ion forming	404
Properties repeat themselves	405
Torque-converter	416
Why some are chemically active	404
Ellis, R S (discusser)	284
Embossing and two-tone finishing of coated fabrics	394
Emergency doors affected by regulations	52
End-point an insufficient criterion	281

**Energy**

Matter and, believed identical	668
Matter and, are interchangeable	402
Utilization of	253
Engine	510
Engine-acceleration tests (John O Eisinger)	184
Engine-cylinder lubrication (Lawrence T Wagner)	311
Engine distillate specification	441
Engine Division, S A E, activities	118, 441, 647, 648, 650, 652
Engine-testing forms, proposed revision of S A E	652

**Engineering**

Aeronautical, and service and commercial aviation	151
Department of Commerce National airways	465, 523
Factors and design limitations of transmissions	268
Problems of Diesel engines	95
Rubber as a material for mechanical	262
Engineering department, relations with metallurgical department	370

**Engineers**

Design, cooperates with production man in automobile building	288
Maintenance	616
Solution of vehicle relation requires aid	58
Today's demand on the automotive	586

**Engines**

Accumulation of solid impurities	312
Advantages of Diesel	98
Air-cooled and water-cooled compared	486
Air-meter for research	224
Airplanes and accessories pictured	586
Altitude-chamber test	514
Aluminum piston and rod bearing-load	241
Apparatus and test methods used for carbon-deposit	60
Automotive possibilities for the oil-burning	98
Basis of calculations	511
Best type of, undecided	427
Causes of failures	484
Charge burns faster at high speeds	392
Commercial airplane operators use military-type	152
Commercial, will need testing	519
Comparison of four and six-cylinder	241
Cowl with louvers gives promise	686
Cowling for weather extremes a problem	686
Cummins method of injection	392
Cylinder lubrication	311
Desirable characteristics listed	391
Determining corrected indicated horsepower	512
Development, design, construction and production of Wright Whirlwind	627
Development of the automotive Diesel oil	388
Development of the high-speed Diesel	87
Diesel, development in America	94
Difficulties presented by exhaust manifold	687
Direct-drive speed of 1400 r.p.m. the limit	685
Disadvantages of Diesel	98
Economical operation requires antiknock fuel	278
Engineering problems of Diesel	95
Exhaust gas for heating the intake	411
First series of tests	187
Flow of liquid in intake-manifold	189
Force required to accelerate reciprocating parts	315
Future of aviation depends on	252
Gas injection requires light fuels	390
Greater flexibility required	410
High-speed Diesel	88
Ice in the inlet system	410
Important variables in operation	311
Improved, meet post-war needs	425
Increase of detonation with carbon	60
Influence of "carbon remover" on carbon deposit	62

Injection of accelerating charge	188
Inspection card and log-book	480
Instructions for use of log-book	481
Insulation for supercharged	30
Intake-manifold depression	313
Internal-combustion, in rail transportation-	424
Long-stroke, due to horsepower tax	50
Lubrication, recent developments	628
Maximum power versus pre-heating of fuel	411
Mechanical condition of the	314
Moment-of-inertia determinations	189
Multi-, drive units available for air-planes	463
Multi-, plane a vehicle for the future	488
Multiple and single, airplane operating costs compared	487
Must develop fuels and, together	279
Oil, are wanted	610
Operating economy	100
Operating temperatures of air-cooled	628
Operation with three, aircraft	486
Overcoming plumbing troubles in airplane	253
Overhauls made at Wright works	484
Piston travels upper half-stroke faster	240
Possible reason for ocean flight failures	485
Power output computed at reduced speed	512
Powerful, not equivalent to four-speed transmission	178
Propeller and, speed too great in airplanes	685
Quantitative effect of carbon on detonation	59
Quick get-away with six-cylinder	239
Reciprocating balance in six and eight-cylinder	315, 448
Reduced speed	99
Relative effect of carbon deposit on various parts	61
Rigid inspections and system employed in Wright Whirlwind	361
Saving in weight an important factor	486
Self-cooling exhaust valves, details of	628
Single versus multiple, airplanes	252
Six and eight-cylinder	317
Six-cylinder, for trucks	239
Small oil locomotives are successful	426
Speed	
Effect of	313
Oil-flow affected by	128
Sudden throttle-opening, effect of	188
Supercharged, performance, calculated and actual	466, 508
Survey of flywheel-housing limits	118
Test equipment and procedure	184
Testing forms revised	650
Two safer than one for airplanes	463
Variable heat control of manifold	284
Variation in horsepower with altitude	511
Various types of solid-injection	388
Would put, inside fuselage	462
Wright Cyclone, performs well	627
Wright Whirlwind	
Commercial operation	468, 478
Production methods	337, 361
England, William Ernest (discusser)	176
Enlarge world demand	238
Ethyl gasoline not injurious to metal	284
Evaluation of causes of shimmy	137
Evolution, human wants and	618

**Exhaust-Gas**

Computation formulas for analysis	572
Derivation of analysis formulas	572
Heating the intake	411
Interpretation of	573
Exhaust-gas-analysis calculations	571
Exhaust valves, details of self-cooling	628
Exhibition of machine-tools in Cleveland	338
Expansion of our aerial defense	220
Experiment results not universally applicable to shimmy	141
Explosions, dust, possibility of	695
Exports, motor-vehicle, increase	159
Exposition of car and building lighting	438
External cylindrical honing (L A Becker)	334, 377
External grinding in automotive production (Oscar A. Knight)	343, 708

**Fabric**

Analysis of coating and	400
Manufacturing and testing rubber-coated automobile	396
Weaves of base	394
Factory, street and office lighting (L C Kent)	438
FALES, E N, ON STANDARDIZATION TESTS IN THE WIND-TUNNEL	497
Falge, R N (discusser)	301
Fan-belt and pulley revision	441

**Fans**

Belts and pulleys standardization	647
Wheels and drums used in test	162



## INDEX TO VOLUME XXI

7

- Farm-equipment development 692  
Farmers buying more cars 518  
Farming, reducing costs of 244
- Farms**  
Handling the product 692  
Mobile equipment development 692  
Favary, Ethelbert (discusser) 434  
FAVARY, ETHELBERG, ON SIX-CYLINDER ENGINES FOR TRUCKS 239  
Fawick, Thomas L. (discusser) 76, 176  
FAWICK, THOMAS L., ON TWO DESIRABLE QUIET DRIVING-RANGES FOR AUTOMOBILES 99  
FENNER, D. C., ON EFFECTS OF LEGISLATION ON DESIGN OF AUTOMOTIVE VEHICLES 49  
FERGUSON, J. L., ON INSPECTION AND MAINTENANCE METHODS 437, 582
- Finishes**  
Catalytic action is confirmed 698  
Fire hazards incidental to the spraying of flammable 344, 693  
Spray-painting hazards long recognized 694  
Fire hazard of ignition system 32
- Fire Hazards**  
Catalytic action is confirmed 698  
Daily cleaning is necessary in spraying flammable finishes 697  
Fire may rupture closed receptacles incidental to spraying of flammable finishes 344, 693  
Ordinary precautions must be observed 697  
Safety of installations demonstrated 698  
Spray-painting, long recognized 694  
Sprinklers are useful in spraying flammable finishes 698  
Storage problems considered 696  
Ventilation is the essential safeguard 695  
Fire hazards incidental to the spraying of flammable finishes (H. L. Miner) 344, 693  
Fire may rupture closed receptacles FIRESTONE, FLOYD A., ON TECHNIQUE OF SOUND MEASUREMENTS 64  
Fishleigh, W. T. (discusser) 401  
Fitch, B. F. (discusser) 47, 78  
Fitting brakeshoes in worn drums 173  
Fixed focus head-lamp, adapter ring proposed for 302  
Fixture, jig and die details 577
- Flammable Finishes**  
Fire hazards incidental to the spraying of 344, 693  
Storage problems considered 696
- Flammable Liquids**  
Flash points classified 694  
Low flash-point and high ignition-point 695  
Flanges, duplex-carburetor 652
- Flash Points**  
Flammable liquids, classified 694  
Low, and high ignition point 695  
Flask, foundry, standardization 11
- Fleet Operation**  
Driver's and mechanic's work wholly separate 435  
Factors governing success 360  
General organization and methods 432  
Inspection and service 433  
Maintenance methods for mixed 432  
Many factors affect ton-mile cost 434  
Sections to cooperate in collecting information on maintenance and 358  
Service equipment for mixed 433  
Ton-mileage versus hourly basis 435  
Value of keeping track of drivers 434  
Floats, structural shapes adaptable for airplane 492  
Flood, Mississippi 132  
Flooding of cylinders with oil 132  
Floor-space an important factor in cost control 120  
Flux of radiant energy overlooked 681  
Flying-boat, pressed construction of a 456  
Flywheel-housing limits, survey of FOKKER, A. H. G., ON AIRPLANES FOR COMMERCIAL AVIATION 250  
FOKKER, A. H. G., ON SINGLE VERSUS MULTI-ENGINE PLANES 461  
Fold test shows resistance of coated fabrics to breaking 398  
Folding steps to aid mail handling 688  
Foote, J. W. (discusser) 78
- Forces**  
Axial and perpendicular components of the, required to accelerate the connecting-rod 316
- Interference with movement trans-forms 414  
Leverage transfers varying 414  
Required to accelerate reciprocating parts of engine 315  
Split into two components 416  
Time element alters magnitude 414  
Foreign brake-lining testing-equipment 562
- Foreign Competition**  
Cannot prevent New 381  
Foreign loans 20  
Foreign trade and investment policy 381  
Foreman 261  
Foremanship courses 40  
Forging, welding and other machines at exposition 347
- Formulas**  
Computation for exhaust-gas-analysis 572  
Derivation of exhaust-gas-analysis 572  
Foulois, Lieut-Col. B. D., U. S. A., (discusser) 252  
Foundry flask standardization 11  
Four billions lent abroad 381  
Four-speed internal-underdrive transmission (C. A. Neracher and Harold Nutt) 72  
Four-speed-transmission-and-axle combination 102  
Franzen, Tore (discusser) 173  
FRANZEN, TORE, ON SOME MECHANICAL FEATURES OF SUSPENSION LEAF-SPRINGS 231
- Freight**  
General theory of container use 602  
Interterminal handling with trailers 602  
Tractor-trailer container terminal-handling of 602  
Freight-handling session at transportation meeting, S. A. E. 602  
Freight-service, terminal, of motor-trucks 230  
French car on an American hill 180  
French development of motor transport 661  
Frequency values check with Ricardo formula 244  
Friction, interleaf, of springs 234  
Friction loads measured, motor-vehicle FRITCH, H. F., ON RAIL-CAR OR MOTOR-COACH: THE ECONOMIC FIELD OF EACH 636  
FROESCH, CHARLES, ON ELECTRIC DRIVE AS A MOTORCOACH TRANSMISSION 268  
FROUNFELKER, E. J., ON TIME-STUDY IN ITS RELATION TO LABOR BUDGET 386, 444, 548  
Fuel consumption, motor-vehicle, measured 636  
Fuel-feed control 410  
Fuel tanks, wings of airplane seem best place for 658
- Fuels**  
Analysis of 575  
Burns faster at high speeds 392  
Coal a raw material, not 150  
Constant volatility at different temperatures best 282  
Cooperative, research bibliography 190  
Cylinder runs cooler with rich mixture 482  
Economical operation of engine requires antiknock 278  
Flow of liquid, in the intake-manifold 189  
Gas injection requires light 390  
Ideal volumetric relations 573  
Mixtures containing, in excess 574  
Must develop engines and, together 279  
Pre-heating versus maximum power 411  
Questions affecting research 19  
Rail-car 610  
Relations between volumes and percentages of combustion products 574  
Spark and velocity effects 18  
Starting-ability compared 15  
Suitable, and mixture essential in Wright Whirlwind engine 481  
Volatility is of different kinds 280  
Volatility of, and cylinder temperature 313
- Furnaces**  
Electric 346  
Gas 346
- Fuselage**  
Construction of metal aircraft 492  
Engines inside 462  
Fusion-welding developments (James C. Bennett) 439
- Gages**  
Many uses of, service stations 715  
Micrometer dial 715  
Variations read easily on dial 715  
GALE, ESSON M., ON BUSINESS CONDITIONS IN CHINA 586  
Gas-electric truck, eight-wheel, a feature 595  
Gas furnaces, variety of 346  
Gas industry, growth of 575  
Gas injection requires light fuels 390
- Gasoline**  
Cracking-control increases antiknock property 279  
Economical operation requires antiknock fuel 278  
End-point an insufficient criterion 281  
Ethyl, not injurious to metal 284  
Government specifications based on volatility 278  
Lean explosive-limits for cracked and straight-run 15  
Next move up to car builder 283  
No danger from sulphur in 283  
Number of cracking plants 324  
Past, present and future 277  
Power revolutionized war 285  
Relation of end-point to oil dilution 284  
Relatively cheap product 282  
Specifications 482  
Three sources of supply 277  
Variable heat control of manifold 284  
Volatility preferable to antiknock quality 282  
Gasoline engines more efficient than steam 426  
Gasoline—past, present and future (A. Ludlow Clayden) 277  
Gasoline-power revolutionized war 285  
Gaunt, W. H., address 606  
GAUNT, W. H., ON HOW CONTAINERS ARE USED IN ENGLAND 602  
Gear drives, electric motors 333  
Gear-finishing machines 338  
Gear-inspection devices 340
- Gears**  
Production of, for Wright Whirlwind engine 368  
Will Americans shift 176
- Gearshift**  
Positions in four-speed transmission 179  
Proposed arrangement 175  
General theory of container use (Bernard Allen) 602  
Generator and motor efficiencies of electric drive 270  
Geniesse, Dr J. C. (discusser) 191  
Geology and resources of petroleum 408  
GIBBONS, W. A., ON RUBBER AS A MATERIAL FOR MECHANICAL ENGINEERING 262  
Gibson, H. C. (discusser) 181  
Gilmer, Walker (discusser) 198  
Glancy, A. R., address 345  
GOLDMAN, MARTIN E., ON SHOP EQUIPMENT AND TOOLS 597  
Gordon, W. R. (discusser) 77, 283  
Grade crossings eliminated 360
- Grades**  
Examples illustrate method of computation 326  
Measuring, cars can climb 286  
Grease-cup and oil thread specification revision 117  
Green, G. A. (discusser) 171
- Grinding**  
Aid to camshaft 709  
Analysis of conventional method of cylinder, necessary 670  
Application of bonded abrasive in cylinder 672  
Coarse stones and kerosene prevent overheating 677  
Corrective measures in cylinder 673  
Developments in cylinder 334, 669  
Errors due to two causes 671  
External, in automotive production 708  
Film 345  
Little honing shows errors 378  
1927 practice in the automotive field 343  
Problems encountered in production 674  
Ratio of rotation to reciprocation 677  
Recent developments in cylinder 674  
Summary of causes of imperfections in cylinder 672  
Two surfaces at once 343  
Grinding machines, automatic 343  
Grinding-stone manufacture 334  
Grinding-wheels 576  
Griswold, W. R. (discusser) 141  
Ground markers for day flying 524  
Group price levels piece rates 549  
Growth, control of, in cast iron 255  
Growth of gas industry 675

GRUSE, W. A., ON CARBON-DEPOSITING TENDENCY OF HEAVIER MOTOR-OILS 20	<b>Heat</b>	168	<b>Ignition Systems</b>	29
Guernsey, C. O. (discusser) 181	Bead burning due to external 168	168	Design requirements 29	
Guggenheim Medal Board of Award, representatives 578	Beads unaffected by, of flexion 168	168	Double magnet 33	
Guides and valve tappets, operations on, for Wright Whirlwind engine 366	Effect on tires 172	172	Electrical requirements 33	
Gun-mounts, motor, three types of 437	Variable control of manifold 284	284	Fire hazard 32	
<b>Guns</b>	Heat at part throttle 412	412	General requirements 28	
Anti-aircraft, effective now 436	Heat-dissipating devices, tests of 168	168	High-speed breaker-mechanism 35	
Rounds from the great 594	Heat-treated chromium-vanadium steels, correlating test-data on 344	344	Ideal 39	
Gwyn, L. R., Jr. (discusser) 78	Heat-treating controlled by metallurgical department 372	372	Insulation for supercharged engines 30	
GWYNNE, G. R., ON SUPERVISION OF MOTOR-VEHICLE TRANSPORTATION AT LONG DISTANCES 604	HEGENBERGER, LIEUT. A. F., U. S. A., ON OVERSEA NAVIGATION 463	463	Radio shielding 30	
Gyroscopic effects on shimmy 141	HELD, P. M., ON DEVELOPMENT OF THE HIGH-SPEED DIESEL ENGINE 87	87	Recent developments in aircraft 28	
<b>H</b>	HERRINGTON, A. W., ON USING TRUCK-OPERATING COSTS TO INCREASE DELIVERY EFFICIENCY 535	535	Impulse frequency, relation of, to noise 243	
HADAWAY, W. S., ON EFFECT OF WET ROADS ON AUTOMOTIVE HEADLIGHTING 21	Herrmann, K. L. (discusser) 64	64	Indices, comprehensive, maintained in standards department 320	
Hadley Airport, inspection trip to 466	HERRMANN, K. L., ON TIRES AS A CAUSE OF SHIMMY 135	135	Industrial anomalies 493	
Hadley Field trip 359	Hess, S. P., ON SOME MECHANICAL FEATURES OF SUSPENSION LEAF-SPRINGS 231	231	<b>Industry</b>	
HALE, J. E., ON EFFECT OF WHEEL-SETTING ON WEAR OF PNEUMATIC TIRES 41	High flying (W. B. Stout) 624	624	Coordination of education 266	
HALL, CHARLES W., ON STUDIES IN METAL CONSTRUCTION 456	High-performance small car here and abroad (T. J. Little, Jr.) 180	180	Relation of research to 265	
Handbook, S. A. E., revised, out Sept. 15 323	High-speed breaker-mechanism for aircraft ignition 35	35	Inert gases, electron groups for 407	
HANRAHAN, M. T., ON TRACTOR-TRAILER EXPRESS-TRANSFER OPERATION 602	Higher standard in cast steel resulting from X-ray testing 159	159	Inertia element adjusts itself to resistance 417	
Hardness, degrees of, cast iron 255	Highway accident prevention 423	423	Infinitesimal size of atom 402	
HARDY, F. I., ON MOTOR-TRUCK'S PLACE IN TRANSPORTATION 44	Highway Research Committee, activities 360	360	Influence of large-scale user on design and construction of automotive equipment (R. E. Plimpton) 589	
Harper, Donald A. (discusser) 303	<b>Highways</b>		Influence of variations of shimmy 137	
Hatton, A. (discusser) 81	Accident prevention 423	423	<b>Injection</b>	
Head-lamp adjusting mechanisms and law enforcement (Walter W. Matthews) 289	Banking curves on hills 209	209	Charge burns faster at high speeds 392	
<b>Head-Lamps</b>	Course in transportation 359	359	Cummins method of 392	
Adapter ring proposed for fixed focus 302	Design and construction of systems 200	200	Gas, requires light fuels 390	
Adjusting mechanisms and law enforcement 289	Factors affecting economical-grade determination 203	203	Large Diesel engines use air 388	
Adjustment 355	Grade crossings eliminated 360	360	Various types of solid 388	
Adjustment in practice 294	Importance of banking neglected 209	209	Injection of accelerating charge 188	
Alignment of fronts 298	Major influences on road location 203	203	<b>Inspection</b>	
Approaching, to consider effect of 354	Prizes for safety suggestions 359	359	Aircraft 516	
Argument detrimental to public safety 306	Road surface effects on vehicles 202	202	Airplane 461	
Attitude of manufacturers 289	Transcontinental 27	27	Card and engine log-book 480	
Complete quotations from letter and paper 308	Users' cost hidden 208	208	Efficient system necessary 546	
Conclusions of the Bureau of Standards 306	HILL, A. M., ON TOMORROW'S MOTORCOACH LEGISLATION 612	612	Great progress made in methods at automobile plants 288	
Conference resolution has been rescinded 306	<b>Hill-Climbing</b>		Human element 120	
Contention based on erroneous assumption 307	Examples illustrate method of computation 326	326	Maintenance and, of axles 437	
Defective lamps demonstrated in single and double-adjustment 305	Measurement by chassis dynamometer 326	326	Motor-vehicles from the standpoint of maintenance and repair 437	
Defects 357	HINGSBURG, FREDERICK C., ON DEPARTMENT OF COMMERCE NATIONAL AIRWAYS ENGINEERING 465	465	Plans for maintenance of airplanes 521	
Difficulties in service and resulting research 297	HOBBS, L. S., ON AIRCRAFT CARBURETERS 409	409	Questions of materials for airplanes 521	
Difficulty of double adjusting demonstrated 303	HOFFMAN, A. H., ON EFFICIENCY TEST FOR RADIATOR-FAN-TYPE AIR-CLEANERS 82	82	Rigid system employed in Wright Whirlwind engine 361	
Double-flament a doubtful development 290	HOLLEY, C. D., ON LACQUER SURFACERS 714	714	Service and, of fleet maintenance 433	
Equipment for adjusting 355	<b>Honing</b>		Why insurance companies make aircraft 462	
Falge's position previously made plain 309	Corrects inaccuracies 378	378	Inspection and maintenance of axles (P. W. Sloan and C. H. Jacobsen) 437	
Fundamental principles 356	External cylindrical 377	377	Inspection and maintenance methods (P. H. Ducker, J. L. Ferguson, and F. C. Patton) 437	
Good results with auxiliary driving-light 27	Factors analyzed 378	378	Instructions for head-lamp adjusters 355	
Inaccuracy in axial alignment 290	Lapping compared with 377	377	Instrument mountings, airplane 581	
Incorrect interpretation placed on statements 307	Little, shows grinding errors 378	378	Instrument research and design 121	
Insensitive, not yet a reality 290	Honing machine used for polishing 380	380	<b>Instruments</b>	
Inspection 355	HORINE, M. C. (discusser) 173	173	Aircraft, for overseas navigation 528	
Instructions for adjusters 355	HORINE, M. C., ON EFFECTS OF LEGISLATION ON DESIGN OF AUTOMOTIVE VEHICLES 49	49	Must evolve procedure for new airplane 520	
Instructions not more complicated 292	Horizon, determination of 530	530	Insulation for supercharged engines 30	
Lens diameters and prism areas 324	Horner, F. C. (discusser) 47	47	Insurance companies, why, make aircraft inspections 462	
More single than double-focusing, in use 307	Horning, H. L. (discusser) 132, 243, 267	132, 243, 267	<b>Intake-Manifold</b>	
Need uniform requirements and tests 304	<b>Horsepower</b>		Depression 313	
Not trying to disrupt conference 308	Determining corrected indicated, in aircraft engines 512	512	Flow of liquid fuel in 189	
Requirement of two adjustments not inconsistent 297	Variation with altitude in aircraft engines 511	511	Integrated production (E. P. Blanchard) 227, 337, 375	
Results of a Massachusetts survey 301	Hot-spot above the carburetor 411	411	Inter-Allied Motor Transport Reserve 662	
Tilt specifications create two classifications 309	How containers are used in England (W. H. Gaunt) 602	602	Interference with movement transforms forces 414	
Two adjustments supported within the industry 298	HOWELL, FRANKLIN D., ON COST PROBLEMS OF MOTOR CARRIERS 228	228	Interleaf friction of springs 234	
Use of vertical adjustment for aiming 293	Hubs, machining of, in Wright Whirlwind engine 367	367	Internal-combustion engines in rail transportation (A. H. Candee) 424	
<b>Headlighting</b>	Huebotter, H. A. (discusser) 144	144	Internal-gear four-speed transmission (S. O. White) 174	
Effect of wet roads on automotive 21	Hukill, H. D. (discusser) 171	171	Internal wheel-brakes for high-speed heavy vehicles (H. D. Church) 171	
Future development not retarded 296	Hulls, structural shapes adaptable for airplane 492	492	International automotive markets 65	
Results obtained from laboratory work 21	Human element in inspection 120	120	Interpretation and investigation 659	
<b>Headlights</b>	Human wants and evolution 618	618	Interpretation of exhaust gas analysis 573	
Brief summary of work done in research 354	HUNT, J. H., ON TODAY'S DEMAND ON THE AUTOMOTIVE ENGINEER 586	586	Interstate and intrastate distinction drawn in motorcoach legislation 704	
Conclusions deduced from tests 27	Hutchinson, R. V. (discusser) 190, 243	190, 243	Interstate commerce, States cannot control 704	
How road tests were made 24	HUTTO, M. C., ON DEVELOPMENTS IN CYLINDER GRINDING 334	334	Interstate motorcoach competition is wide open 704	
Progress in fundamental research 353	Hydrodynamic analogy 222	222	Interterminal freight handling with trailers 602	
Research furthered 19	<b>I</b>		Intrastate and interstate distinction drawn in motorcoach legislation 704	
HEALY, L. J. D., ON RECENT TRENDS IN AUTOMOBILE-TIRE CONSTRUCTION 586	<b>Ignition</b>		Intrastate certificates are good protection 705	
	Battery		Investigation and interpretation 659	
	Development 37	37	Investment policy and foreign trade 381	
	Versus magneto 38	38	Ionization principles, practical applications of 406	
			Ions, elements that form negative 404	



## INDEX TO VOLUME XXI

9

**Iron and Steel Division, S A E**

- Activities 117  
Standards approved by letter-ballot 6  
Is war inevitable? 374

**J**

- JACK, R K, ON CONSTANTINESCO TORQUE-CONVERTER 413  
JACKLIN, H M, ON MECHANICAL DE-TERIORATION OF VEHICLES 635  
JACKSON, P B (discusser) 148, 244, 283  
JACOBSEN, C H, ON MAINTAINING MOTOR-TRUCK AXLES 437, 583  
JAMES, W S, ON RELATION OF RESEARCH TO INDUSTRY 265  
JANITZKY, E J, ON CORRELATING TEST-DATA ON HEAT-TREATED CHROMIUM-VANADIUM STEELS 344  
Jig, fixture and die details 577  
Jinnette, C W (discusser) 676  
Johnson, A M (discusser) 677  
JOHNSON, BENJAMIN W, ON TRAINING MEN FOR THE AUTOMOTIVE INDUS-TRY 625  
Joint Committee on Pattern Equipment Standardization, activities 11  
JONES, BRADLEY, ON OVERSEA NAVIGA-TION 463, 253  
Jones, C S (discusser)  
JONES, E T, ON DEVELOPMENT OF WRIGHT WHIRLWIND ENGINE, ITS DESIGN, CONSTRUCTION AND PRODUCTION 627

**K**

- KELLETT, W P, ON SCIENTIFIC TRANS-PORTATION 77  
KENT, L C, ON FACTORY, STREET AND OFFICE LIGHTING 438  
Kerosene and coarse stones prevent over-heating in cylinder grinding  
KEYS, C M, ON TRENDS IN MILITARY AIR-PLANES 452  
KIENHOLZ, W S, ON TRAINING MEN FOR THE AUTOMOTIVE INDUSTRY 625  
Kimball, E W (discusser) 148  
Klein, Alexander (discusser) 253  
Kneip, Commander J B, U S N (dis-cusser) 690  
KNIGHT, OSCAR A, ON EXTERNAL GRIND-ING IN AUTOMOTIVE PRODUCTION 343, 708

**L****Labor**

- Budgets, relation to time-study 386, 444  
Machinery and 679  
Making, valuable 705  
Method of predetermining cost 386  
Problems only partly solved 120  
Requirements enter into rail-car opera-tion 611  
Time-study in its relation to budget 548  
Turnover a real problem 598  
Lacquer enamel, relation to surfacer 714  
Lacquer surfacers (C D Holley) 714  
Lake, C S (discusser) 79

**Lamps**

- Basing produces filament inaccuracies 302  
Cement withstands 80-lb. pull 302  
Defective, demonstrated in single and double-adjustment head-lamps 305  
Landing gear requires special attention 688

**Lapping**

- Analysis of disadvantages of cylinder honing compared with 672  
Lapsley, Robert (discusser) 377  
Latest development in automotive equip-ment (Major L H Campbell, U S A) 588

**Laws**

- Brake-development relation to state 51  
Connecticut motor-vehicle 373  
Head-lamp adjusting mechanisms and enforcement 289  
Make overloading economically neces-sary 54  
Motorcoach operation in southern New England 703  
Motor-vehicles governed by regulations and 49

**Leaf Springs**

- Dynamic tests of 235  
Ineffectiveness of absorption 238  
Interleaf friction of 234  
Relation of number of leaves to damp-ing 237  
Some mechanical features of suspen-sion 231  
Stresses due to torque reaction 234  
Lean explosive-limits for cracked and straight-run gasolines and other motor fuels 15

- Leather substitutes, tests on deck ma-terial  
LEE, MYRON A, ON TEACHING PRODUC-TION PRINCIPLES TO ENGINEERING STUDENTS 193

**Legislation**

- Concerted action is needed  
Effects of, on design of automotive vehicles 707  
Interstate and intrastate distinction drawn 49  
Laws in southern New England 703  
Motor-truck operators oppose regula-tion 706  
New bill to be drafted for motorcoach operation 707  
Today's motorcoach 612, 703  
Tomorrow's motorcoach 612, 706  
Lemon, B J (discusser) 142, 172, 266

**Lens**

- Diameters and prism areas 324  
Water on, diffuses beam 23  
Lenz, Arnold (discusser) 256  
LESTER, H H, ON X-RAY TESTING OF METALS AT WATERTOWN ARSENAL 155  
Leverage transfers varying forces, how 414  
Liability insurance control is not estab-lished 705  
Libby, A D T (discusser) 208  
LIEBOWITZ, B, ON ACCELEROMETER TEST-ING APPARATUS 121  
LIEBOWITZ, B, ON CONTACT-ACCELEROM-ETER GAP-ERROR 121  
LIENESCH, C F, ON PUT THE AIRPLANE TO WORK 348  
Lift, effect of speed on 500  
Light-alloy pistons (G D Welty) 146

**Lighting**

- Airport 466  
Airways 466  
Airways for night flying 524  
Boundary, of intermediate fields 525  
Car and building 438  
Factory, street and office 438  
Failure of current guarded against in airway 525  
Motor-vehicles 438  
Passenger-cars affected as to 50  
Lighting Division, S A E, activities 324  
Lighting the motor-vehicle (H H Magd-sick) 438  
Lights, controllable and retractable landing 688  
Limiting velocities for wind-tunnel tests 501  
LITTLE, T J, JR, ON HIGH-PERFORMANCE SMALL CAR HERE AND ABROAD 180  
LIVINGSTONE, C J, ON CARBON-DEPOSIT-ING TENDENCY OF HEAVIER MOTOR-OILS 20

**Load Factors**

- Grading of 518  
Increasing, in aircraft 517  
New classification of airplanes by 520

**Loads**

- Heaviest, carried at greatest altitude 684  
Large unit, are more economical 56  
One trip in three of tractor-trailer made without 679  
Loans, foreign 20  
Lockheed type of brake-testing equipment 564  
Locking the piston-pin 150  
Locomotives, small oil-engined, are suc-cessful 426

**Log-Book, Engine**

- Inspection card and 480  
Instructions for use of 481  
Long-stroke engine due to horsepower tax 50  
Louvers, cowl with, gives promise 686  
Lowry, E J, ON CAST IRON IN ITS RELA-TION TO THE AUTOMOTIVE INDUSTRY 254  
Lubricants Division, S A E, activities 441, 581  
Lubricating-oil viscosity numbers 441

**Lubrication**

- Engine, recent developments in 628  
Over-oiling, effects of 133  
Special importance in engines 481  
Luke, A C F (discusser) 698

**M**

- MACCOULL, NEIL, ON QUANTITATIVE EF-FECT OF ENGINE CARBON ON DETO-NATION 59  
MACCRACKEN, WILLIAM P, JR, ON COM-MERCIAL AIRPORT FOR NEW YORK CITY 583

**Machine-Shop**

- Methods, change in 287  
Organization and operation 542  
Machine tapers to be standard 12  
Machine-Tool and Steel Exposition, Na-tional 346  
Machine Tool Builders' Exposition at Cleveland 338  
Machine-tool exhibitions 219  
Machine-tool session at Cleveland pro-duction meeting 333

**Machine-Tools**

- Allowances for depreciation 533  
Application of electric motors to 334, 383  
Can create profits 532  
Example of replacement method 533  
Net profit from modern 386, 532  
Reserve for depreciation of 532  
Standards 578  
Systematic modernizing of equipment 533  
Machinery and labor 679

**Machining**

- Hubs and valve rockers in Wright Whirlwind engine 367  
Operations on cylinder-head for Wright Whirlwind engine 363  
Testing and, crankcase casting for Wright Whirlwind engine 362  
MAGDSICK, H H, ON LIGHTNING THE MO-TOR-VEHICLE 438  
Magnesium-alloy pistons 148  
Magnesium pistons, pitting of 150

**Magneto**

- Battery ignition versus 38  
Double, for aircraft ignition 33  
MAHAN, H E, ON AIRPORT LIGHTING 466  
Mail, folding steps on airplane to aid handling 688  
Mail plane, interior arrangement of the 687

**Maintenance**

- Advantages of unit-replacement system 545  
Army organization for work 540  
Army system of 597  
Army system of motor transportation 539  
Axle inspection and 437  
Coast repair-shop practices summarized 598  
Consolidation and cooperation neces-sary 542  
Discussion of Army system 599  
Divisions or departments 542  
Efficient inspection system is neces-sary 546  
Engineer 616  
Good shop equipment and system needed 598  
Included in road cost 205  
Inspection of motor-vehicles from the standpoint of repair and 437  
Labor turnover a real problem 598  
Magnitude of industry 598  
Mixed-fleet, methods 432  
Motorcoach-tire 579  
Operation and, of motor-vehicles 67  
Plans for inspections of airplanes 521  
Research aids 580  
Sections to cooperate in collecting in-formation on fleet operation and 358  
Shop equipment and tools 597  
System of making unit repairs 546  
West Coast motor-vehicle 597  
Widely distributed oil-trucks 430  
Work assigned according to natural abilities 542  
Maintenance and operation (J F Win-chester) 183  
Maintenance and operation (E C Wood) 583  
Maintenance engineer 616  
Maintenance of widely distributed oil-trucks (C G Bussey) 430  
Maintenance on the West Coast (E C Wood) 597  
Maintenance session at transportation meeting, S A E 597  
Maintaining motor-truck axles (P W Sloan and C H Jacobsen) 437, 583  
Making labor valuable 705  
Malkin, Irving (discusser) 47  
Man-hour, output per 276

**Manifolds**

- Difficulties presented by exhaust 687  
Vacuum-brake, connections 649  
Variable heat control of 284  
Manly, C M (discusser) 303  
Manly, C M, obituary 472  
MANLY, C M, ON ACCELEROMETER TEST-ING APPARATUS 121  
Man-production and pay 522  
Manufacturing and testing rubber-coated automobile fabrics (M N Nickowitz) 396  
Marks, E S (discusser) 132, 175

MARLEY, SAMUEL P. ON CARBON-DEPOSITING TENDENCY OF HEAVIER MOTOR-OILS	20	Mileage Costs		Sturdy-front appearance gives confidence	658
Mass production and high wages	58	Analysis of truck operation	536	Tire maintenance	579
Mass production required to decrease cost	543	Variation in truck	537	Today's legislation	612, 703
Mass transportation in cities	325	Military and commercial operation of motor vehicles	666	Tomorrow's legislation	612, 706
Massachusetts head-lamp survey results	301	Military developments, aircraft industry is in close touch with	474	Trend toward parlor-car type	580
MASURY, A F. ON ARMY VEHICLES REQUIRE GREAT POWER	588	Military-type engines, commercial operators use	152	Weight distribution affects tire cost	654
Materials of construction	370	Milling Acme threads	8	Motor Fuels	
Mathematical analysis of the torque converter	418	MILLER, H L. ON FIRE HAZARDS INCIDENT TO THE SPRAYING OF FLAMMABLE FINISHES	344, 693	Lean explosive-limits	15
Mathematical symbols, report on	4, 118	Mississippi flood	134	Three sources of supply	277
Mather, G C (discusser)	177	Mixed-fleet maintenance methods (R R Rutherford)	432	Motor liner	550
Matter and energy are interchangeable	402	Mobile farm-equipment development	692	Motor mountings, classes of	383
Matter and energy believed identical	668	Mobile gun and tanks in mimic battle	595	Motor oils, carbon-depositing tendency of heavier	20
MATTHEWS, WALTER W. ON HEAD-LAMP ADJUSTING MECHANISMS AND LAW ENFORCEMENT	289	Mock, F C (discusser)	191	Motor Transport	
Mayer, W J (discusser)	182	Modern automobile-production methods (W K Swigert)	286	Body varieties must be restricted	663
McClellan, H S (discusser)	697	Modern naval aircraft (Lieut-Com Lawrence B Richardson, U S N)	245	Essential requirements of design	665
McCook Field wind-tunnel	499	Modern practices in automobile-body designing (A E Northup)	257	French development	661
McKim, C D (discusser)	176	Moment-of-inertia determinations	189	In combat	662
Mead, G J (discusser)	253	Money		Inter-Allied Reserve	662
Measurement of taper-shaft	225	Paper, not included in stock	145	Means of transporting tactical units	661
Measuring temperature	681	Stock in the United States	145	Military and commercial operation	666
Mechanical deterioration of vehicles (H M Jacklin)	635	Monoplane and biplane, relative advantages of	689	Motor-truck requirements	664
Mechanical information sheets subcommittee, S A E report at transportation meeting	602	Monoplane or biplane (C H Chatfield)	460	Number of vehicles required in emergency	664
Mechanic's and driver's work wholly separate	435	Monoplanes, high versus low-wing	462	Place in military field	660
Mechanized army will win next war (Benedict Crowell)	588	MONTEITH, CHARLES N. ON PROBLEMS IN TRANSPORT-AIRPLANE DESIGN	348, 682	Procurement-plan	665
Meetings		Montgomery, J C (discusser)	548	Refinement of detail in army	661
Aeronautic, S A E		MOORE, DR ERNEST C. ON TRAINING MEN FOR THE AUTOMOTIVE INDUSTRY	626	Repair and parts-supply facilities	665
Inspection trip to Hadley Airport	466	MOSELEY, C C. ON COMMERCIAL OPERATION OF AIR SERVICE	348	Theater of operations	662
Announced	350	Moskovich, F E (discusser)	176	Zone of the interior	662
Registration	468	Motor bearings standard proposed	441	Motor-truck operating-conditions on the Pacific Coast (E C Wood)	603
Reviewed	455	Motor carriers, cost problems of	228, 443	Motor-truck session at transportation meeting, S A E	603
Spokane, reviewed	348	Motorcoach design (K J Ammerman)	612, 653	Motor-Trucks	
Annual, S A E, announced	621	Motorcoach Division, S A E		Analysis of usage	680
Council, S A E		Activities	13, 649	Boston & Maine begins operation	44
September	578	Standards approved by letter-ballot	6	Characteristics and field of usefulness	630
November	717	Motorcoach influence on electric cars	507	Common-carrier trucking under state regulations	604
Production Advisory Committee, S A E, at production meeting	342	Motorcoach operation on the West Coast (E C Wood)	612	Coordinated rail and, transportation	604, 680
Production, S A E		Motorcoach-tire maintenance	579	Eight-wheel gas-electric, a feature	595
Program	217	Motorcoaches		Heavy, most seriously affected by regulations	53
Registration	444	Battery specifications revised	117	Idle time a big cost-factor	359
Reviewed	333	Comfortable seats and wider windows	507	Large unit-loads are more economical	56
Semi-Annual, S A E, announced	621	Concerted action is needed for legislation	707	Laws make overloading economically necessary	54
Transportation, S A E		Cost of increasing width and headroom	658	Maintaining axles	583
Announced	351	Cost problems of	228	Manufacturers must help solution of transportation problem	46
Program	599	Depreciation of an unknown quantity	228	Need studies of aggregate weight transported	55
Reviewed	597	Design	612, 653	Operating-conditions on the Pacific Coast	603
Merchandising	616	Development hampered by regulations	52	Operators oppose regulation	706
Metal		Economy of standard body	658	Place in transportation	44
Construction of aircraft	489	Electric drive as a transmission	268	Principal uses	680
Ethyl gasoline not injurious to	284	Emergency doors, signals and brakes affected	52	Quick get-away with six-cylinder engines	239
Interpretation of defects as to causes	157	Excessive overhang, effects of	654	Railroads must help	46
Queer, and rare-earth groups of atoms	407	Factors that determine passenger comfort	654	Requirements	664
Weight can be saved with aircraft	489	Fluctuating material and supply prices	229	Selling methods	45
Welds stronger than adjacent	440	Future trend of operation	613	Six-cylinder engines for	239
X-ray pictures show nature of defects	156	Improvements	230	Small-capacity, cause large losses	56
X-ray testing of metals at Watertown Arsenal	155	Influence on electric cars	507	Solution of problem of regulations requires engineers' aid	58
Metal Aircraft		Interstate and intrastate distinction drawn	704	Solve the essentials first	46
Expedient for saving die-cost	490	Interstate competition is wide open	704	Terminal freight-service	230
Fuselage construction	492	Interstate regulation is desired	706	Using operating costs to increase delivery efficiency	604
Refinements and precautions	493	Intrastate certificates are good protection	705	When speed is economy	45
Structural shapes adaptable for hulls and floats	492	Intrastate and interstate distinction drawn	704	Who will establish fundamentals	45
Tubular trusses are efficient for ribs	492	Laws in southern New England	703	Motor-truck's place in transportation (F I Hardy)	44
Metal construction of aircraft (Commander R D Weyerbacher, U S N)	457, 489	Liability insurance control is not established	705	Motor-vehicle exports increase	159
Metal research problems	531	New bill to be drafted	707	Motor-vehicle regulation subcommittee, S A E, report at transportation meeting	601
Metal-to-Metal Brakes		New Jersey regulations	13	Motor-vehicle speed in Connecticut	170
Difficulties	173	Operation on the West Coast	612	Motor-Vehicles	
Require power application	173	Operators cautioned	360	Accident reports in Connecticut	374
Metallurgical considerations of cast iron	255	Other features of design and operation	613	Accounting and parts replacement	590
Metallurgical Department		Private touring	580	Accounting study of operation and maintenance	113
Assisting purchasing department	372	Rail-car or; the economic field of each	610	Accounting systems for operation of Army	70
Control of heat-treating	372	Results of deviations from standard design	658	Depots retained	210
Guarding against "pirate" parts	373	Seating arrangements are studied	612	Organization for maintenance work	540
Helps production	372	Simplicity characterizes good design	654	Require great power	588
Materials of construction chosen	370	Speed, quietness and comfort necessary	507	System of maintenance	597
Relations with engineering department	370	Standard unit-costs and classification needed	229	Auxiliary service and safe operation	590
Solves problems for service department	372	States cannot control interstate commerce	704	Average and typical individual results in tests	638
Supplies data for sales department	372	Stream-line principles followed	507	Basis of emphasis on cost keeping	113
Metallurgy, relation of, to production	344, 370			Bibliography for operators	116
Meteorological cooperation in aviation recounted	464			Breaking down expense	114
Meteorologist's help is important in overseas navigation	700			Broad cooperation and elaborate basis needed in accounting	114
Michel, C A (discusser)	309			Charts show big operating-cost reduction	600
Micrometer dial-gages, uses of	715			Collection of data	590
				Connecticut law	373



## INDEX TO VOLUME XXI

11

Consumption, power and friction loads measured	636	NICKOWITZ, M N, ON MANUFACTURING AND TESTING RUBBER-COATED AUTO-MOBILE FABRICS	396	<b>Parts</b>	
Define mechanical improvements	61	Night flying, airways lighting for	524	Design adapted to available equipment	227
Definitions and measurement units		Nitrogen, valence of, why 3	404	Metallurgical department guarding against "pirate"	373
Important in accounting	114	Noise, relation of impulse frequency to	243		
Design affected most by regulations	50	NOLAN, JOHN, ON PLACE OF AN AIRPORT IN CITY PLAN	468, 584	<b>Parts and Fittings Division, S A E</b>	
Economical life of	54	Nollan, E H (discusser)	401	Activities	6, 117
Economics involve both roads and		NOLLAN, E H, ON CELLULOSE-NITRATE COATED FABRICS	393	Standards approved by letter-ballot	6
Effect of legislation on design	49			Passenger Car Division, S A E activities	6
Equipment required in Connecticut	373			Passenger-space required, ample	181
Exports increase	159			Pattern Equipment Standardization Joint Committee, activities	11
Five mileage classes tested	635			PATTON, F C, ON INSPECTION AND MAINTENANCE METHODS	437, 582
Fleet accounting classifications	359			Pay and man-production	522
Functional organization of production department	541			Paye, G C (discusser)	675
Governed by laws and regulations	49			Performance sells cars	182
How designers might help	207			Periodic impulses, rotary motion transmitted by	415
Ideal classification of accounting	114			Permeability by water, test for, of coated fabrics	398
Influence of large-scale user on design and construction of automotive equipment	589			Perpendicular and axial components of the force required to accelerate the connecting-rod	316
Inspection from the standpoint of maintenance and repair	437				
Internal wheel-brakes for high-speed	171			<b>Petroleum</b>	
Let facts dispel prejudice	68			Geology and resources	408
Lighting the	438			Natural-gas, and, research	285
Machine-shop organization and operation	542			Production in 1925	385
Maintenance and operation	583			Petroleum and natural-gas research	285
Maintenance of widely distributed oil	430			Piston-pin, locking the	150
Maintenance on the West Coast	597			Piston-rings discussed	149
Mechanical deterioration of	635			Piston slap problem	148
Methods of repair	431				
Might improve use of	208			<b>Pistons</b>	
Must develop cheap day storage	325			Aluminum, and rod bearing-load	241
National organizations to cooperate to improve service	580			Aluminum, for Diesel engines	149
New developments forced by restrictions	56			Design of aluminum	147
No conflict with railroad	230			Installation of aluminum	147
Number required in emergency	664			Light-alloy	146
Operation and maintenance	67			Light weight and high conductivity of aluminum-alloys	146
Operation and Maintenance Committee, S A E, to act in advisory capacity on uniform code	192			Magnesium-alloy	148
Pay \$1,000,000,000 road costs	58			Problem of slap	148
Present vagueness of fundamental terms	113			Travels upper half-stroke faster	240
Problems of the transportation manager	431			Wristpin holes broached in Y-metal for Wright Whirlwind engine	365
Progress in congestion	547			Pitting of magnesium pistons	150
Railroads and	229			Place of an airport in city plan (John Nolen)	468
Report on state regulations	646			Planning an around-the-world flight (Edward F Schlee)	522
Road courtesy and costs	358			Pleuthner, Charles (discusser)	143
Road surface effects on	202			Plimpton, R E (discusser)	208
Seeking to unify braking requirements	52			PLIMPTON, R E, ON INFLUENCE OF LARGE-SCALE USER ON DESIGN AND CONSTRUCTION OF AUTOMOTIVE EQUIPMENT	589
Servicing	69			Polishing, honing machine used for	380
Special, for short-haul delivery purposes	593			POPE, BRIGADIER-GEN FRANCIS H, U S A, ON RELATION OF COMMERCIAL TO ARMY TRANSPORTATION	608, 660
Speed in Connecticut	170			PORTER, J P, ON COMMERCIAL AVIATION	715
State regulations	116				
States most active regulatory bodies	50			<b>Position-Finding</b>	
Successful operation of	360			Complexity of aircraft	528
Supervision of transportation at long distances	604			Radio signals	529
System of making unit repairs	546			Powell, T C, address	606
Truck frames welded successfully	440				
Types adopted	664			<b>Power</b>	
We must train men for operation and maintenance	68			Army vehicles require great	538
What, do to roads	201			Metal-to-metal brakes require, application	173
What type of tires	68			Motor-vehicle, measured	636
Motor-vehicles pay \$1,000,000,000 road costs	58			Output computed at reduced engine-speed	512
MOTTASHED, J CHARLES, ON NEGLECTED VALUES OF TIME-STUDY	347, 691			Pre-heating versus maximum	411
Multi-purpose machine is a boon in automobile production	288			Power and prosperity (Charles M Ripley)	338
MURPHY, E L, JR, ON COMMON-CARRIER TRUCKING UNDER STATE REGULATIONS	604			Power control in airplanes will be needed	248
				Power, Eugene (discusser)	434
				Power-generation trend and possibilities	659
				<b>Powerplants</b>	
				Accessories for airplane	248
				Problem of a cheaper commercial airplane	153
				Pre-heating versus maximum power	411
				Preparing students for new developments	198
				Preprints of papers at production meeting	218
				<b>Pressures</b>	
				Bearing, on wristpin	241
				Calculation of centrifugal, on oil in crank-cheek	131
				In oil-film	132
				Recommended tire	139
				Relation to oil-flow	129
				Pressures in the oil-film	132
				<b>Prices</b>	
				Fluctuating material and supply	229
				Group, levels piece rates	549

Prices and sales volume interdependent	488	Purchasing department assisted by metallurgical department	372	<b>Repairs</b>	
Prism areas and lens diameters	324	Put the airplane to work (C F Lienesch)	348	Motor transport facilities	665
Prizes still open for competition for air flights	586			System of making unit	546
<b>Problems in transport-airplane design</b> (Charles N Monteith)	348, 682	<b>Q</b>		<b>Reports</b>	
<b>Problems of the transportation manager</b> (E M Rondot)	431	Quantitative effect of engine carbon on detonation (Neil MacCoul and D B Brooks)	59	Accounting subcommittee, S A E, at transportation meeting	601
<b>Processes used in making grinding stones</b> (P H Walker)	334	Quantitative stretched-membrane analogy of splined shafts	222	Continuation of 1922, on brake-lining tests	551
<b>Production</b>		<b>R</b>		Mathematical symbols	4, 118
Assignment of tasks and recognition of work	543	Radiant energy, flux of, overlooked	681	Mechanical information sheets subcommittee, S A E, at transportation meeting	602
Bibliography of papers	639	Radiator-lacing revisions approved	648	Motor-vehicle regulation subcommittee S A E, report at transportation meeting	601
Change in machine-shop methods	287	<b>Radio</b>		Nomenclature subcommittee, S A E, at transportation meeting	601
Contrast of old with new methods of automobile	286	For bad-weather flying	526	Operation and Maintenance Committee, S A E, at transportation meeting	644
Control forms and organization chart	194	Shielding the ignition system	30	State regulations of motor-vehicles	646
Conveyor systems aid line-assembly	288	Signals for position finding	529	Transportation meeting, S A E	597
Design engineer cooperates with, man in automobile building	288	Use of goniometric signals	530	West Coast subcommittee, S A E, on operation and maintenance	601
Design of mechanical parts adapted to available equipment	227	Rail-car and motorcoach session at transportation meeting, S A E	608		
Distribution and	448	Rail-car fuel (E Wanamaker)	610	<b>Research</b>	
Economies effected increase prosperity	376	Rail-car or motorcoach; the economic field of each (H F Fritch)	610	Aids maintenance	580
Gears and cam ring for Wright Whirlwind engine	368			Airline route presents a laboratory for	683
Good leadership of first importance	544	<b>Rail-Cars</b>		Air-meter for engine	224
Integrated	227, 337, 375	Auxiliaries are a troublesome problem	428	Brief summary of work done in headlight	354
Man and pay	522	Carry express shipments	610	Cooperative fuel, bibliography	190
Mass, and high wages	58	Design and operation of self-propelled	608	Difficulties of head-lamps in service and resulting	297
Mass, required to decrease cost	543	Design now based upon experience	608	Headlight	19
Metallurgist helps	372	Electrical transmission best for larger units	427	Furthered	353
Methods outlined	713	Fuel	610	Progress in fundamental	121
Modern automobile methods	286	Mechanical transmissions	427	Instrument and design	531
Multi-purpose machine is a boon	288	Motorcoach or; the economic field of each	610	Metal problems	266
Petroleum in 1925	385	Requirements of labor enter	611	Neither mysterious nor idle	285
Problems encountered in cylinder grinding	674	Successful boiler is awaited	610	Petroleum and natural-gas	19
Proportional	618	Railroad man	382	Questions affecting fuel	265
Rates changed for increased	548	<b>Railroads</b>		Relation of, to industry	679
Refinement of integrated	376	Boston & Maine begins motor-truck operation	44	Spirit of	152
Relation of metallurgy to	344, 370	Coordinated motor-truck and, transportation	680	<b>Research Committee, S A E</b>	
Simultaneous operations with differing conditions	376	Design and operation of self-propelled cars	608	Activities	18
Teaching, principles to engineering students	193	Electrification not universally available	425	Topics proposed by members	19
Work units combined for greatest efficiency	375	General theory of container use	602	Resistance, inertia element adjusts itself to	417
Wright Whirlwind engine methods	337, 361	Internal-combustion engines in transportation	424	Resonance, overcoming automobile	183
<b>Production Advisory Committee, S A E, meeting at production meeting</b>	342	Motor-vehicles and	229	Retractable and controllable landing lights	688
<b>Production Division, S A E, standards approved by letter ballot</b>	6	Must help truck transportation	46	Reynolds number, effect of size of air-foil and	502
<b>Production Engineer</b>		No conflict with motor-vehicles	230	Ribs, tubular trusses are efficient for	492
Floor-space an important factor in cost control	120	Small oil-engined locomotives are successful	426	Ricardo formula; frequency values check with	244
Labor problems only partly solved	120	Superior service	690	Richardson, E G (discusser)	698
Problems of cost control	119	Railroads and motor-vehicles	229	RICHARDSON, LIEUT-COM LAWRENCE B, U S N, ON MODERN NAVAL AIRCRAFT	245
<b>Production engineering (A R Glancy)</b>	345	Raw materials, proper use of, in iron	256	<b>Riding Comfort</b>	
<b>Production engineering standards</b>	576	Recent developments in aircraft ignition-systems (F G Shoemaker)	28	Fundamental dimensions that affect	257
<b>Production Meeting, S A E</b>		Recent developments in engine lubrication (R E Wilson)	628	Treatment that enhances	261
Cleveland machine-tool session	333	Recent trends in automobile-tire construction (L J D Healy)	586	<b>Riding-Qualities</b>	
Cleveland sessions	217	Reciprocating and rotating elements, division of connecting-rod into, theoretically correct	317	Instrument research and design	121
Detroit sessions	218	Reciprocating balance in engines of six and eight cylinders (M W Davidson)	315, 448	Instrumentation (R W Brown)	19, 126
Machine-tool exhibitions during	219	Reciprocation to rotation, ratio of, in cylinder grinding	677	Right use of street signals	395
Preprints of papers	218	Recovering oil from wells	447	RIPLEY, CHARLES M, ON POWER AND PROSPERITY	338
<b>Production Advisory Committee meeting</b>	342	Recovery of major refined oil-products	324	Rivet, small, report approved	321
Program	218	Reducing costs of farming	244	<b>Roads</b>	
Registration of 1927	444	Reed, E E (discusser)	206	Best type of heavy-traffic	208
Reviewed	333	<b>Registration</b>		Courtesy and costs	358
Stag carnival	218, 341	New York City aeronautic meeting	468	Economic stage of the problem	207
Steel session	343	Production meeting	444	Economics involve both vehicles and	54
<b>Production of starting, lighting and ignition apparatus (C E Wilson)</b>	713	Transportation meeting	614	Good, should precede automobiles	207
<b>Profile of Acme threads (Earle Buckingham)</b>	7	<b>Regulations</b>		How motor-vehicle designers might help	207
<b>Profits, machine-tools can create</b>	532	Heavy trucks most seriously affected	53	Improvement produces wealth	206
<b>Programs</b>		Motorcoach development hampered by	52	Maintenance included in cost	205
Aeronautic meeting, S A E	350	Motor-vehicle design affected most by	50	Major factors that cause destruction	54
Transportation meeting, S A E	352, 599	Motor-vehicles governed by laws and	49	Major influences on location	203
Progress in congestion	547	Report on state motor-vehicle	646	Motor-vehicles pay \$1,000,000,000 costs	58
Progress of civil aviation in Britain	66	State motor-vehicle	116	Rules of the	570
Propeller with rotatable blades described	349	REINHART, H A, ON PACIFIC COAST TRACTOR USAGE	630	Surface on vehicle, effects of	202
<b>Propellers</b>		Relation of commercial to Army transportation (Brigadier-Gen Francis H Pope, U S A)	608, 660	Thick-edge and reinforced concrete-slab design	204
Adjustable and reversible, needed in airplanes	249	Relation of metallurgy to production (J M Watson)	344, 370	Wet, effect on automotive headlighting	21
Engine and, speed too great in airplanes	695	Relation of research to industry (W S James)	265	What vehicles do to	201
<b>Prosperity</b>		Repair, methods of motor-vehicle	431	Widening	496
Advertising fortifies	382	Repairing, design should simplify body	629	Wider, for more cars	63
Economies effected increase	376	Repair-shop practice, Coast, summarized	598	Work New Jersey is doing	206
Prosperity and power (Charles M Ripley)	338			ROCHE, J A, ON SELECTION OF MATERIALS FOR AIRCRAFT STRUCTURES	456, 494
Proving-ground, Aberdeen, visit	219			RONDOT, E M, ON PROBLEMS OF THE TRANSPORTATION MANAGER	431
Pulley and fan-belt revision	441			Rotary motion transmitted by periodic impulses	415
Pulleys, fans and belts, standardization	647			Rotatable blades, propeller with, described	349



## INDEX TO VOLUME XXI

13

Rotating and reciprocating elements,  
division of connecting-rod into, theo-  
retically correct 317

**Rotating-Weight Method**

Special design requirements 124  
Theory 122  
Rotating weights versus crank motions 122  
Rotation to reciprocation, ratio of, in  
cylinder grinding 677  
Round unslotted-head bolts 6

**Rubber**

Application of the properties of 264  
Bibliography 264  
Effect of compounds 263  
Material for mechanical engineering 262  
Physical tests on compounds 397  
Under and over-curing, effects of 401  
Rubber as a material for mechanical  
engineering (W A Gibbons) 262  
Rubber-coated automobile fabrics, manu-  
facturing and testing 396  
Rubber parts to absorb vibration 118  
Rubber Products Committee D-11 of  
American Society for Testing Ma-  
terials, activities 118  
Rubber tested for sulphur blooming 399  
Rules of the road 570  
Rust causes many valve-spring break-  
ages 592  
RUTHERFORD, R R, ON MIXED-FLEET  
MAINTENANCE METHODS 432  
Ryan, W D'Arcy (discusser) 304

**S A E**

Accounting study 113  
Constitutional amendment adopted 109  
Council Meetings  
September  
November  
S A E Handbook, revised, out Sept 15  
S A E steel, new, recommended 117

**Safety**

Airplane 593  
Airplane operation 250  
Argument on head-lamps detrimental  
to public 306  
Installations demonstrated in spraying 698  
Measures featured 714  
Prizes for suggestions 359  
Speed with 716  
Safety-code, brake, issued 322  
Safety-Code for Brakes and Brake Test-  
ing Sectional Committee, activities 322  
Safety in the air 593  
Sales and price volume interdependent 488  
Sales department supplied with data by  
metallurgical department 372  
Sales possibilities, increased automobile 267  
Sanders, W C (discusser) 429  
SANDERS, W C, ON DESIGN AND OPERA-  
TION OF SELF-PROPELLED RAILROAD  
CARS 608  
Sanford, R S (discusser) 173  
Scaife, A J (discusser) 76, 77, 172  
Scarr, F J (discusser) 48, 81  
SCHLEE, EDWARD F, ON PLANNING AN  
AROUND-THE-WORLD FLIGHT 623  
Schoff, A L (discusser) 170  
Science and bolsheviks 242  
Scientific and Engineering Symbols and  
Abbreviations Sectional Committee,  
activities 118  
Scientific-study basis of accidents on  
highways 423  
Scientific transportation (W P Kellett) 77  
Screw threads, developing standard Acme 7  
Seating arrangements of motorcoaches  
are studied 612  
Seats, comfortable, and wider windows  
in motorcoaches 507

**Sectional Committees**

Bolt, Nut and Rivet Proportions, ac-  
tivities 321  
Safety-Code for Brakes and Brake  
Testing, activities 322  
Scientific and Engineering Symbols and  
Abbreviations  
Activities 118  
Report on mathematical symbols 4  
Small Tools and Machine-Tool Ele-  
ments  
Activities 12  
Representatives 717  
Standardization of Pipe Threads, rep-  
resentative 717  
Sections, S A E, cooperate to secure  
information on fleet operation and  
maintenance 358  
Seger, Earl (discusser) 697  
Selection of materials for aircraft struc-  
tures (J A Roché) 456, 494  
Selling methods of motor-trucks 45  
Semi-annual meeting, S A E, announced 621

**Service**

Equipment for operator of mixed-fleet 433  
Improving automotive 387  
Inspection and, of fleet 433  
Modern shop-equipment needed 69  
Motor-vehicles 69  
National organizations to cooperate to  
improve 580  
World leadership in facilities 716  
Service aviation, aeronautical engineer-  
ing and commercial aviation (Ed-  
ward P Warner) 151  
Service department, problems solved by  
metallurgical department 372  
Service stations, many uses of gages in 715  
Seymour, L D, address 606  
SEYMOUR, L D, ON SINGLE VERSUS MULTI-  
ENGINE AIRPLANES 716

**Shafts**

Measurement of taper fittings 225  
Torsional vibration of, effects of 244  
Shale oil 256

**Shimmy**

Accurate settings needed to prevent 141  
Are we "passing the buck" 139  
Caster angle is the key 140  
Evaluation of causes 137  
Experiment results not universally ap-  
plicable 141  
Gyroscopic effects 141  
Influence of variations 137  
Looking for the Ethiopian 135  
Remedies 142  
Some field experience 144  
Steering connections influence 140  
Tires as a cause of 135  
Tires contribute fundamental cause 136  
What is 135

Single versus multi-engine airplanes (L  
D Seymour) 716  
SHOEMAKER, F G, ON RECENT DEVELOP-  
MENTS IN AIRCRAFT IGNITION-SYS-  
TEMS 28  
Shop equipment and too's (Martin E  
Goldman) 597  
Shop equipment, good, and system needed 598

**Signals**

Affected by regulations 52  
Street, right use of 395  
SIKORSKY, I I, ON STUDIES IN METAL  
CONSTRUCTION 457  
Simplification or specialization reduces  
cost 542  
Single versus multi-engine planes (A H  
G Fokker) 461  
Six-cylinder engines for trucks (Ethel-  
bert Favary) 239  
Size, effect of airfoils, and Reynolds  
number 502  
SLOAN, P W, ON MAINTAINING MOTOR-  
TRUCK AXLES 437, 583  
Small car can be comfortable 182  
Small-rivet report approved 321

**Small Tools and Machine-Tool Elements  
Sectional Committee**

Activities 12  
Representatives 717  
Solid injection, various types of 388  
Some mechanical features of suspension  
leaf-springs (Tore Franzen, S P  
Hess and Clark A Tea) 231  
Sound, technique of measurements 64  
Southwick, L F (discusser) 209  
Spark and velocity effects 18  
SPARROW, S W, ON OIL-FLOW THROUGH  
CRANKSHAFT AND CONNECTING-ROD  
BEARINGS 127  
Special vehicles for short-haul delivery  
purposes (Lee W Oldfield) 593

**Specifications**

Gasoline and oil 482  
Government, based on volatility 278  
Motorcoach battery, revised 117  
Oil and grease-cup thread, revision 117  
Tilt, create two classifications of head-  
lamp 309  
Speed with safety 716

**Speeds**

Direct-drive, of 1400 r.p.m. the limit 685  
Effect of, very important on brake-  
drum temperatures 165  
Engine and propeller, too great in air-  
planes 685  
Engine, effect of 313  
Lift, effect on 500  
Motor-vehicle, in Connecticut 170  
Oil-flow affected by engine 128  
Power output computed at reduced en-  
gine 512

Quietness and comfort necessary in  
motorcoaches 507  
Radical body designed for 629  
Range of airplane, an unsatisfactory  
basis for classification 521  
Reduced engine 99  
Safety in automobile 716  
Slow, keeps trucks out of shop 435  
When motor-truck, is economy 45  
Wind-tunnel range from 4 to 300  
m.p.h. 500  
Spirit of research 679  
Spline, ten, side-bearing fittings 322

**Splined Shafts**

Hydrodynamic analogy 222  
Quantitative stretched-membrane an-  
alogy 222  
Torsional strength of 222

**Spraying**

Daily cleaning is necessary 697  
Fire hazards incidental to, of flamma-  
ble finishes 344, 693  
Hazards long recognized in flammable  
finishes 694  
Ordinary precautions must be ob-  
served 697  
Safety installations demonstrated 698  
Sprinklers are useful 698  
Ventilation is the essential safeguard 695  
Sprinklers are useful in spraying finishes 698  
Springs, relation of impulse frequency  
to noise 243  
SPROWLS, G M (discusser) 43  
Stag carnival at production meeting 218, 340  
STALNAKER, R H, ON INSPECTION OF  
MOTOR-VEHICLES FROM THE STAND-  
POINT OF MAINTENANCE AND REPAIR 437

**Standardization**

Dies 577  
Dimensional variations and, of elec-  
tric motors 384  
Drills 576  
Fans, belts and pulleys 647  
Fixtures 577  
Foundry flask 11  
Gage proposed 639  
Grinding-wheels 576  
Jigs 577  
Machine tapers 12  
Machine-tool 578  
Milling cutters 576  
Production engineering 576  
Radiator-lacing revisions approved 648  
Taps 576  
Tests in McCook Field 5-ft. tunnel 498  
Tests in the wind-tunnel 497  
Tool 576  
Tool-post openings and tools 577  
Wind-tunnel, a vital need 498  
Standardization of Pipe Threads Sectional  
Committee, representative 717  
Standardization tests in the wind-tunnel  
(E N Fales) 497  
Standardized parts, aircraft assembled  
quickly from 457

**Standards**

Approved by letter ballot 6  
Comprehensive indices maintained 320  
Developing Acme threads 7  
Surveys on SAE 320  
Starting-ability of fuels compared 15  
State motor-vehicle regulations 116  
States cannot control interstate com-  
merce 704  
Static balancing-machine 339  
STEDMAN, E W, ON CONTROL OF AIR-  
CRAFT DESIGN 460, 516  
Steel forgings, cylinder barrels machined  
from, for Wright Whirlwind engine 364  
Steel session at production meeting,  
S A E 343

**Steels**

Correlating test-data on heat-treated  
chromium-vanadium 344  
S A E new, recommended 117  
Steering connections, influence on  
shimmy 140  
Stein, F W (discusser) 677  
Steinberger, M F (discusser) 81  
STEWART, R W, ON TRAINING MEN FOR  
THE AUTOMOTIVE INDUSTRY 626  
Stones, processes used in making grind-  
ing 334

**Storage-Batteries**

Revision proposed 649  
Terminals, proposed 648  
Storage of motor-vehicles, must develop  
cheap day 325  
Storage problems considered in flam-  
mable finishes 696

STOUT, W. B., ON COMMERCIAL AVIATION	589	<b>Testing Machines</b>		Thompson, F. C. (discusser)	73, 176
STOUT, W. B., ON HIGH FLYING	624	Brake-lining, in some other labora-		Threading and turning machines	340
STOUT, W. B., ON STUDIES IN METAL		tories	558	Three-speed transmissions on large	
CONSTRUCTION	456	Bureau of Standards brake-lining	553	European cars	176
Stream-line principles followed in motor-		Carson type brake-lining	558	Throttle-opening, effect of sudden	188
coaches	507	Foreign brake-lining	562	Tierney, J. W., address	605
Street signals, right use of	395	In some other laboratories	558	Tilt specifications create two classifica-	
Streets, full capacity not utilized	325	Lockheed type brake	564	tions of head-lamps	309
Strength of combining fabric, test for	399	Studebaker type brake-lining	560	Time element alters magnitude of force	414
<b>Stresses</b>		Used by a truck builder for brake-		<b>Time-Study</b>	
Analysis on plane structure required	520	linings	564	Advantages and results of	387
Connecting-rods	241	Testing rubber-coated automobile fab-	396	Application of	198
Due to torque reaction in leaf springs	234	rics		May include machine capacity	691
Hydrodynamic analogy	222	<b>Tests</b>		Neglected values of	691
Quantitative stretched-membrane an-		Accelerometer, apparatus	121	Problem created by acquirement of	
alogy	222	Accelerometer apparatus experimental	126	skill	549
Strickland, W. R. (discusser)	133	Accelerometer for practical road-		Time-study an instrument of increasing	
Structural elements of airplanes	246	testing	126	value to management	347, 691
Structure of atom (E. F. Barker)	402	Aging, determine ultimate value of		Time-study in its relation to labor	
Structure, stress analysis on plane, re-		coated fabrics	398	budget (E. J. Frounfelker)	386, 444, 548
quired	520	Altitude-chamber	514	Tire pressures	138
Studebaker type of testing-machine for		Anchorage, shows adhesion of coating		<b>Tire Wear</b>	
brake-linings	560	to fabric	398	Camber, effect of too much	42
Students, teaching production principles		Apparatus and methods used for car-		Effect of wheel-setting	41
to engineering	193	bon in engines	60	No mathematical analysis	42
Studies in metal construction (Charles		Applied to coated fabrics	397	Toe-in and camber affect	136
W. Hall, I. I. Sikorsky and W. B.		Applied to tires	142	<b>Tires</b>	
Stout)	456	Assembling and, the Wright Whirl-		Accuracy of manufacture	139
Suction type supercharger, development		wind engine	368	Balancing	142
desirable	509	Bureau of Standards		Head burning due to external heat	168
Sulphur blooming, rubber tested for	399	Brake-lining	554	Beads unaffected by heat of flexion	168
Sulphur in gasoline, no danger from	283	Equipment for brake-lining	553	Cause of shimmy	135
<b>Supercharged Engines</b>		Commercial engines in airplanes will		Contribute fundamental cause of	
Altitude-chamber test	514	need	519	shimmy	136
Analysis of problem	509	Conclusions deduced from, for carbon		Effect of wheel-setting on wear of	
Supercharged engine performance, cal-		deposit	62	pneumatic	41
culated and actual (Opie Cheno-		Conclusions deduced from headlight	27	Heat, effect on	172
weth)	508	Connecting-rod for Wright Whirlwind		Motorcoach, maintenance	579
Supercharger	509	engine	368	Pressures	138
<b>Superchargers</b>		Continuation of 1922 report on brake-		Recent trends in automobile construc-	
Development of suction type desirable	509	lining		tion	586
Method of computation of tempera-		Correlating data on heat-treated chro-		Recommended pressures	139
ture rise and horsepower input	515	mium-vanadium steels	344	Tests applied to	142
Problems with the	410	Crankcase casting for Wright Whirl-		Weight distribution affects cost	654
Superior railroad-service	690	wind engine	362	What type of	68
Supervision of motor-vehicle transporta-		Deck material	6	Tires as a cause of shimmy (K. L. Herr-	
tion at long distances (G. R. Gwynne)	604	Description of air-cleaner	86	mann)	135
Surface tension, effect of	448	Description of apparatus for air-		Today's demand on the automotive engi-	
Surfaces, relation to lacquer enamel	714	cleaner	83	neer (J. H. Hunt)	586
<b>Surge</b>		Details of equipment for motor-vehicle	635	Today's motorcoach legislation (Robert	
How valve-spring, is made manifest	593	Dynamic, of leaf springs	235	H. Newcomb)	612, 703
Notes on valve-spring	243	Dynamometer, of brake-drum heat in		Toe-in and camber affect tire wear	136
Survey of national airways	523	dual wheels	160	Tomorrow's motorcoach legislation (A.	
SWIGERT, W. K., ON MODERN AUTOMOBILE-		Efficiency, for radiator-fan-type air-		M. Hill)	612, 706
PRODUCTION METHODS	286	cleaners	82	Ton-mileage versus hourly basis of fleet	
<b>T</b>		Engine-acceleration	184	operation	435
Tabb, W. E. (discusser)	676	Equipment and methods in brake-		Tool-post openings and tools	577
<b>Tanks</b>		lining	552	Tool standardization	578
Crawler tractors and	436	Equipment and procedure for engine	184	<b>Tools</b>	
Have been greatly improved	588	First series of engine	187	Shop equipment and	597
Mobile gun and, in mimic battle	595	Fold, shows resistance to breaking of		Tool-post openings and	577
Taper-shaft, measurement of	225	coated fabrics	398	<b>Torque</b>	
Tappets and guides, valve, Wright		Heat-dissipating devices	166	Cannot vary rotary motion	422
Whirlwind engine operations on	366	How road, were made on headlights	24	Insulator and electric braking	270
Taps, drills and milling cutters	576	Importance of tensile-strength, of		<b>Torque Converter</b>	
Taxes, long-stroke engine due to horse-		coated fabrics	400	Action when starting and climbing	421
power	50	Improved technique resulting from the		Application to motor-car	419
Taxicab tests	13	wind-tunnel	498	Constantinesco	413
TEA, CLARK A., ON SOME MECHANICAL		Interpretation of results of airfoil	506	Elements	416
FEATURES OF SUSPENSION LEAF-		Kind of dust used in air-cleaner	83	Mathematical analysis	418
SPRINGS	231	Limiting velocities for wind-tunnel	501	Torque reaction, stresses due to	234
Teaching production principles to engi-		Materials and finished product of		Torsional strength of splined shafts	222
neering students (Myron A. Lee)	193	coated fabrics	394	Torsional vibration of shafts, effects of	244
Technical problems of the control of air-		Need uniform requirements for head-		Townsend, R. A. (discusser)	548
plane airworthiness (Clarence M.		lamps and	304	<b>Tractor-Trailer</b>	
Young)	460, 519	Physical, on rubber compounds	397	Express-transfer operation	602, 678
Technique of sound measurements		Purpose of wind-tunnel	498	How the units are operated	678
(Floyd A. Firestone)	64	Recommendations on airfoil	506	One trip in three made without load	679
Teetor, Ralph R. (discusser)	132	Resistance to edge-cracking of coated		Tractor-trailer express-transfer opera-	
<b>Temperatures</b>		fabrics	400	tion (M. T. Hanrahan)	602, 678
Carburetor stove for zero	686	Scrub, of coated fabrics usable by the		<b>Tractors</b>	
Constant volatility at different, best	282	consumer	397	Crawler and tanks	436
Flux of radiant energy overlooked	681	Standardization, in McCook Field 5-ft.		Major operations for	630
Measurements and method of testing	162	tunnel	498	Pacific Coast usage	630
Measuring	681	Standardization in the wind-tunnel	497	Trailer express-transfer operation	602, 678
One-sided viewpoint likely to mislead	681	Strength of combining coated fabric	399	Trade extension-courses becoming im-	
Operating, of air-cooled engine	628	Sulphur blooming, for rubber	399	portant	626
Volatility of fuel and cylinder	313	Taxicabs	13	<b>Traffic</b>	
Templin, E. W. (discusser)	182	Temperature measurements and meth-		Best type of heavy, road	208
Tenney, P. L. (discusser)	74	od of	162	Must segregate fast from slow	325
Tensile-strength test of coated fabrics,		True rolling of wheels	42	Progress in congestion	547
importance of	400	Two ways of using coated fabric	400		
Tension, surface, effect of	448	Ultra-violet light, of coated fabric			
Ten-spline side-bearing fittings	322	insufficient	401		
Terminal freight-service of motor-trucks	230	Vehicles in five mileage classes	635		
Test for permeability by water of coated		Weather-exposure of coated fabrics			
fabrics	398	extends over 1 year	400		
Test instruments displayed at exposi-		Wheels, fans and drums used in	162		
tion	346	X-ray method too expensive for			
		routine	158		
		X-ray, of metals at Watertown Arse-			
		nal	155		
		Thee, First-Lieut W. C., U. S. A. (discusser)	198		
		THEE, FIRST-LIEUT W. C., U. S. A., ON			
		ARMY SYSTEM OF MAINTENANCE OF			
		MOTOR TRANSPORTATION	539, 597		
		Thermal efficiency and cylinder diam-			
		eter	239		
		Thick-edge and reinforced concrete-slab			
		design of road	204		



## INDEX TO VOLUME XXI

15

**Trailers**

- Interterminal freight handling with 602  
Semi, selected 678  
Tractor, express-transfer operation 602, 678

**Training**

- Cooperative, in automotive industry 625  
Men for operation and maintenance of motor-vehicles 68  
Should start automotive engineering schools 626  
Students taught related subjects 626  
Trade extension-courses becoming important 626  
Work aided by nation and state 625  
Training men for the automotive industry (John C Beswick, Benjamin W Johnson, W S Klenholz, H A Campion, Dr Ernest C Moore, Elizabeth Clark, and R W Stewart) 625  
Transcontinental highways 27

**Transmission Division, S A E**

- Activities 118, 322  
Subject assigned 717

**Transmissions**

- Advantages of electric 182  
Advantages of plain bearings 178  
Circulatory and oscillatory methods differ 416  
Clutch-housing limits, survey of 118  
Comparison of electric drive with standard 270  
Electric drive as a motorcoach 268  
Electrical, best for larger rail-cars 427  
Engineering factors and design limitations of electric drive 268  
Four-speed and axle combination 102  
Four-speed internal-underdrive 72  
Gearshift positions in four-speed 179  
Internal-gear four-speed 174  
Mechanical, on small cars 427  
Most driving in fourth speed 177  
Powerful engine not equivalent to four-speed 178  
Preliminary experiments with four-speed 176  
Proposed gearshift arrangement 175  
Rotary motion transmitted by periodic impulses 415  
Short demonstration not conclusive 178  
Three speeds on large European cars 176  
Will Americans shift gears 176  
Transport-airplane, problems in design 682

**Transportation**

- Army system of maintenance of motor Automotive 539  
Commercial application of the pooling principle 632  
Commercial to Army, relation of 608, 660  
Communication advanced with 606  
Conditions in England 667  
Coordination of facilities 680  
Coordinated rail and motor-truck 604, 359  
Course in highway 360  
Factors governing success of highway 667  
Fundamental identity of mechanical mediums 424  
Internal-combustion engines in rail 325  
Mass, in cities 661  
Motor transport means for, of tactical units 46  
Motor-truck manufacturers must help solution of, problem 44  
Motor-truck's place in 666  
Pooling and coordinating 348  
Problems in design of airplanes 431  
Problems of manager 46  
Railroads must help motor-truck Scientific 77  
Solve essentials of motor-truck, first 46  
Supervision of motor-vehicle, at long distances 604  
Tractor-trailer express-transfer operation 602, 678  
Types adopted by the Army 608  
Transportation banquet 351  
Transportation equipment design 579

**Transportation Meeting, S A E**

- Announced 351  
Banquet 605  
Committee personnel 352  
Freight-handling session 602  
Maintenance session 597  
Motor-truck session 602  
Operation and Maintenance Committee, S A E 601  
Report 644  
Preprints of papers available 352  
Program 608  
Rail-car and motorcoach session 614  
Registration at 1927 597  
Reviewed 597

**Trends in military airplanes (C M Keys)**

- Trinity of industry 452  
Trip to Hadley Field 578  
Truck builder's testing-machine for brake-linings 350  
Truck frames welded successfully 564, 440

**Trucks**

- Analysis of mileage costs of operation 536  
Proper interpretation of data presented on operation 538  
Slow speed keeps, out of shop 435  
Using operating costs to increase delivery efficiency 535  
Variation in mileage cost 537  
TRUNDLE, G T, JR, ON NET PROFIT FROM MODERN MACHINE-TOOLS 336, 532  
Turbulence, effect on airfoils 504  
Turning and threading machines 340  
Two desirable quiet driving-ranges for automobiles (Thomas L Fawick) 99

**U**

- Ultra-violet light test of coated fabrics insufficient 401  
Under and over-curing of rubber effects 401  
Uniform vehicle code 192  
Unit-replacement system advantages 545  
United States, money stock in the 145  
Uses of micrometer dial-gages (Warren Ames) 715  
Using truck-operating costs to increase delivery efficiency (A W Herrington) 535, 604  
Utilization of energy 253

**V**

- Vacuum-brake manifold connection 649  
Valence of nitrogen, why, is 3 404  
Valve rockers, machining of Wright Whirlwind engine 367  
Valve-spring surge, notes on 243  
**Valve-Springs**  
Alloy wire heat-treated after colling 592  
Design and material decide life 592  
Double, multiple and tandem 593  
How surge is made manifest 593  
Material and heat-treatment of 590  
Notes on design 590  
Rust causes many breakages 592  
Small-diameter straight preferred 591  
Wire surface-defects removed with acid 591  
Valve tappets and guides, operations on Wright Whirlwind engine 366  
Valve washers, treatment of Wright Whirlwind engine 366

**Valves**

- Details of self-cooling exhaust 628  
Treatment of Wright Whirlwind engine 366  
Van Halteren, A S (discusser) 144  
Van Sant, John E (discusser) 433  
Velocities, limiting for wind-tunnel tests 501  
Ventilation is the essential safeguard to spraying hazard 695  
Vertical adjustment of head-lamps, use of, for aiming 293

**Vibrations**

- Exercising automobile 182  
Rubber parts to absorb 118  
Vibratory tendency eliminated in American patent 422  
Viscosity, lubricating-oil numbers 441  
Visibility increased by beam directed to right 26

**Volatility**

- Constant, at different temperatures 282  
best 280  
Different kinds in fuels 313  
Fuel, and cylinder temperature 278  
Government gasoline specifications based on 282  
Preferable to antiknock quality 573  
Volumetric relations of fuel, ideal 551  
VON AMMON, S, ON CONTINUATION OF THE 1922 REPORT ON BRAKE-LINING TESTS

**W**

- Wages, mass production and high 58  
WAGNER, LAWRENCE T, ON ENGINE-CYLINDER LUBRICATION 311  
WALKER, P H, ON PROCESSES USED IN MAKING GRINDING STONES 334  
Wall, W G, address 436  
Wall, W G (discusser) 98, 175  
WALL, W G, ON COMMERCIAL AVIATION 589  
WANAMAKER, E, ON RAIL-CAR FUEL 610

**War**

- Citizenry capable of exercising power 374  
Is it inevitable 374  
Ward, C C (discusser) 697  
WARNER, EDWARD P, ON APPLICATION OF NON-MILITARY AIRCRAFT TO NAVAL PURPOSES 465, 474  
WARNER, EDWARD P, ON SERVICE AVIATION, AERONAUTICAL ENGINEERING AND COMMERCIAL AVIATION 151  
Waste, window washing saves 550  
Water-cooled and air-cooled engines compared 486  
Water on lens diffuses beam 23  
Watertown Arsenal, X-ray testing of metals at 155  
WATSON, J M, ON RELATION OF METALLURGY TO PRODUCTION 344, 370  
Weather-exposure test of coated fabric extends over 1 year 400  
Weather reports and communications for flying 526  
Weaves of base fabric 394

**Weights**

- Adjustable, correct balance 711  
Can be saved with metal aircraft 489  
Distribution in automobiles 174  
Excess, penalizes lower standard 154  
Installation of electric drive 269  
Light, of aluminum-alloys 146  
Motorcoach, distribution affects tire cost 654  
Need studies of aggregate, transported 55  
Saving, an important factor in airplanes 486  
Weinert, R H (discusser) 64

**Welding**

- Forging and other machines at position 347  
Fusion, developments 439  
Must revise conception of design of motor-vehicle parts 440  
Truck frames successfully 440  
Welds stronger than adjacent metal 440  
WELTY, G D, ON LIGHT-ALLOY PISTONS 146  
West Coast subcommittee, S A E report at transportation meeting 601  
WEYERBACHER, COMMANDER R D, U S N, ON METAL CONSTRUCTION OF AIRCRAFT 457, 489  
Wheel-setting, effect of, on wear of pneumatic tires 41

**Wheels**

- Dynamometer test of brake-drum heat in dual 160  
Fans and drums used in test 162  
Fine adjustment should be possible 43  
Speed, effect of, very important on brake-drum temperature 165  
Test for true rolling 42  
Use of brakes on airplane 252

**Whirlwind engine production methods**

- Whitcraft, L N (discusser) 337, 361  
White, S O (discusser) 207  
WHITE, S O, ON INTERNAL-GEAR FOUR-SPEED TRANSMISSION 73  
Why some elements are chemically active 404  
Wickenden, T H (discusser) 255  
Widening roads 496  
Wider roads for more cars 63  
Will Americans shift gears 176  
WILLIAMS, GEORGE M, ON COMMERCIAL AVIATION 589  
WILSON, C E, ON PRODUCTION OF STARTING, LIGHTING AND IGNITION APPARATUS 713  
Wilson, R E (discusser) 267  
WILSON, R E, ON RECENT DEVELOPMENTS IN ENGINE LUBRICATION 628  
WINCHESTER, J F, ON AUTOMOTIVE TRANSPORTATION 632  
WINCHESTER, J F, ON OPERATION AND MAINTENANCE 67, 183  
Wind-speed, effect of, on air-cleaners 85

**Wind-Tunnels**

- Improved technique resulting from tests 498  
Limiting velocities for tests 501  
McCook Field 499  
Purpose of tests 498  
Speed range from 4 to 300 m.p.h. 500  
Standardization a vital need 498  
Standardization tests in 497  
Standardization tests in McCook Field 5-ft. 498  
Window washing saves waste 550  
Windows, wider, and comfortable seats in motorcoaches 507  
Wine, L A (discusser) 310

**Wings**

Cantilever, of wood	251
Best place for fuel tanks	688
Wire, alloy, heat-treated after coiling	592
Wire surface-defects of valve springs removed with acid	591
Wollensak, A C (discusser)	104
WOOD, E C, ON MAINTENANCE AND OPERATION	583
WOOD, E C, ON MAINTENANCE ON THE WEST COAST	597
WOOD, E C, ON MOTORCOACH OPERATION ON THE WEST COAST	612
WOOD, E C, ON MOTOR-TRUCK OPERATING CONDITIONS ON THE PACIFIC COAST	603
Woodberry, R S (discusser)	79
Woolson, H T (discusser)	74
Word and action	477
Work assigned according to natural abilities	542
Work units combined for greatest efficiency	375
World demand, enlarge	238
World leadership in service facilities	716
World motor-transport congress	115
World oil situation	357
Wright Cyclone engine performs well	627
Wright Whirlwind engine production methods (Lee M Beatty)	337, 361

**Wright Whirlwind Engine**

Assembling	368
Cam ring production	368
Causes of failures	484
Commercial operation	478
Connecting-Rod	368
Machining	368
Testing	368
Crankcase casting	362
Machining	362
Testing	367
Crankshaft operations	364
Cylinder barrels machined from steel forgings	363
Cylinder-head machining	482
Cylinder runs cooler with rich mixture	364
Cylinders assembled with shrink fits	479
Description of	627
Development of, its design construction and production	368
Gear production	367
Hub machining	361
Inspection	484
Overhauls made at works	361
Production methods	484
Running time and operating data	485
Some of the minor troubles experienced	481
Suitable fuel and mixture essential	368
Testing	478
Three types of aircraft employed	367
Valve rocker machining	366
Valve tappets and guides	

Valves and valve washers	366
Wristpin holes broached	365
Y-metal pistons	365
Wright Whirlwind engine in commercial operation (C H Biddlecombe)	468, 478
Wristpin, bearing pressures on	241
Wristpin holes broached in Y-metal pistons for Wright Whirlwind engine	365

**X****X-Rays**

Apparatus and method of use	156
Higher standard in cast steel resulting	159
Pictures show nature of defects in metal	156
Too expensive for routine testing	158
Valuable for developing better casting-designs	158
X-ray testing of metals at Watertown Arsenal (H H Lester)	155

**Y**

Y-metal pistons, wristpin holes broached in Wright Whirlwind engine	365
Yocom, A M (discusser)	173
YOUNG, CLARENCE M, ON TECHNICAL PROBLEMS OF THE CONTROL OF AIRPLANE AIRWORTHINESS	460, 519
Younger, John (discusser)	198, 698, 712
Youngren, H T (discusser)	62



